

# Annual Progress Report

## Fiscal Year 2010

Reported by: Joseph F. McKeon, Colonel, MC



## United States Army Aeromedical Research Laboratory

March 2011

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U.S. Army Medical Research and Materiel Command  
Fort Detrick, Maryland 21702-5012



<b>REPORT DOCUMENTATION PAGE</b>					<i>Form Approved OMB No. 0704-0188</i>							
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<b>1. REPORT DATE (DD-MM-YYYY)</b> 15-03-2011		<b>2. REPORT TYPE</b> Annual Final			<b>3. DATES COVERED (From - To)</b> 01 Oct 09 to 30 Sep 10							
<b>4. TITLE AND SUBTITLE</b> U.S. Army Aeromedical Research Laboratory Annual Progress Report Fiscal Year 2010					<b>5a. CONTRACT NUMBER</b>  <b>5b. GRANT NUMBER</b>  <b>5c. PROGRAM ELEMENT NUMBER</b>  <b>5d. PROJECT NUMBER</b>  <b>5e. TASK NUMBER</b>  <b>5f. WORK UNIT NUMBER</b>  							
<b>6. AUTHOR(S)</b> Reported by Joseph F. McKeon, Colonel, MC					<b>8. PERFORMING ORGANIZATION REPORT NUMBER</b>  FY10							
<b>7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)</b> U.S. Army Aeromedical Research Laboratory P.O. Box 620577 Fort Rucker, AL 36362-0577					<b>10. SPONSOR/MONITOR'S ACRONYM(S)</b>  USAMRMC							
<b>9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)</b> U.S. Army Medical Research and Materiel Command 504 Scott Street Fort Detrick, MD 21702-5012					<b>11. SPONSOR/MONITOR'S REPORT NUMBER(S)</b>  							
<b>12. DISTRIBUTION/AVAILABILITY STATEMENT</b> Approved for public release, distribution unlimited.												
<b>13. SUPPLEMENTARY NOTES</b>  												
<b>14. ABSTRACT</b> The Annual Progress Report includes a description of the research conducted by the U.S. Army Aeromedical Research Laboratory (USAARL) during fiscal year 2010 (FY10) and an overview of FY10 activities. It also summarizes the FY10 personnel and funding strength of the USAARL.												
<b>15. SUBJECT TERMS</b>  												
<b>16. SECURITY CLASSIFICATION OF:</b> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 5px;"> <tr> <td style="width: 33%; padding: 2px;">a. REPORT</td> <td style="width: 33%; padding: 2px;">b. ABSTRACT</td> <td style="width: 33%; padding: 2px;">c. THIS PAGE</td> </tr> <tr> <td style="text-align: center; padding: 2px;">UNCLAS</td> <td style="text-align: center; padding: 2px;">UNCLAS</td> <td style="text-align: center; padding: 2px;">UNCLAS</td> </tr> </table>			a. REPORT	b. ABSTRACT	c. THIS PAGE	UNCLAS	UNCLAS	UNCLAS	<b>17. LIMITATION OF ABSTRACT</b>  SAR		<b>18. NUMBER OF PAGES</b>  75	
a. REPORT	b. ABSTRACT	c. THIS PAGE										
UNCLAS	UNCLAS	UNCLAS										
<b>19a. NAME OF RESPONSIBLE PERSON</b> Loraine Parish St. Onge, PhD					<b>19b. TELEPHONE NUMBER (Include area code)</b> (334) 255-6906							

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## **U.S. Army Aeromedical Research Laboratory — Fiscal Year 2010**

### **Background**

The United States Army Aeromedical Research Laboratory (USAARL) was originally established as the United States Army Aeromedical Research Unit (USAARU) in October 1962. As envisioned by Major General Spurgeon Neel, U.S. Army, the unit's mission was to provide direct aviation medical research support to all Army aviation and airborne activities, and to provide a central aeromedical research and reference library. Technical evaluation of aircraft and personnel equipment, aeromedical in-flight observations, and field problems analysis reported by other aviation agencies were part of the unit's early research program.

In 1969, USAARU was redesignated a Laboratory. Construction began on a new vivarium, and a year later, the Helicopter In-flight Monitoring System (HIMS), an airborne system capable of simultaneously measuring pilot and helicopter performance, was designed, built, and installed aboard the Laboratory's JUH-1J research helicopter. Lighting systems and paint schemes for collision avoidance were being addressed.

In May 1978, ground was broken for a new laboratory facility, with completion in March 1981. During the 1980s, USAARL scientists and support staff became increasingly involved in field studies throughout the Army in assessing hazards of military systems and operations, and biomedical means of enhancing Soldier selection, performance, and protection.

In 1990, USAARL was honored with the Department of Defense Award for Excellence. For its support and contributions to Desert Shield/Desert Storm, USAARL was awarded the Army Superior Unit Award in 1992.

In April 2004, USAARL was dedicated in memory of the "Father of Army Aviation Medicine," Major General Neel, for his integral role in the development of the principles of aeromedical evacuation of battlefield casualties.

Today, laboratory and field studies continue on the ground and in helicopter flight in those research disciplines unique to USAARL – vision and visual enhancement/protection, auditory injury/protection, impact injury/protection, jolt effects, crew stress/workload, and physiological life support. A JUH-60A aircraft and an NUH-60 flight simulator with specialized cockpit environmental controls help researchers with their flight performance investigations. Physicians, engineers, and safety experts work together to understand human injuries and damage to personal protective equipment from a crash. Researchers analyze and correct design and operational deficiencies in flight helmets, crashworthy seating, restraint systems, and develop criteria for future Warfighter systems.

This report presents an overview of USAARL activities during fiscal year 2010 (FY10), identifies current areas of research, and gives a brief description of the research programs being conducted.

## **U.S. Army Aeromedical Research Laboratory — Fiscal Year 2010**

### USAARL Mission and Vision

The USAARL's mission is to preserve and enhance the health, safety, combat effectiveness, and survivability of the U.S. Army Warfighter.

Our vision is to function as the Department of Defense Center of Excellence for mounted Soldier operational medical research. Special focus areas include:

- Prevention and reduction of neurosensory injury
  - Crash injury protection, survival, novel restraints, seating systems
  - Helmet design, fit, performance, helmet-mounted devices (HMD)
  - Visual displays and eye protection
  - Auditory displays and hearing protection
- Fitness-for-duty research for wounded warriors
  - Soldier performance after neurosensory injury (vision, hearing, central nervous system)
  - Return-to-Duty criteria and strategies
  - Soldier performance in degraded operations (night, noise, fatigue)
- Test & evaluation of medical equipment for medical evacuation (MEDEVAC) environment

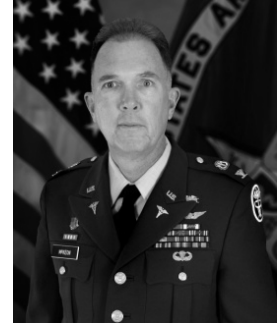
Through research, the USAARL supports the U.S. Army Medical Department's mission to "conserve the fighting strength."



## U.S. Army Aeromedical Research Laboratory — Fiscal Year 2010

### From the Commander

The USAARL is proud to present this summary of achievements for fiscal year (FY10). USAARL continued to make significant contributions to preserving and enhancing the health, safety, combat effectiveness, and survivability of the Warfighter. Our researchers demonstrated their extraordinary agility in adapting to the constantly changing demands involved in protecting our Soldiers from an adaptive and tenacious enemy. USAARL established new, exciting and relevant collaborative partnerships with international organizations, other Army Medical Department (AMEDD) facilities, and academia.



The Warfighter Performance and Health Division (WPHD) was extraordinarily productive in FY10. The WPHD researchers published nine technical reports, five peer-reviewed papers, and one book chapter. Findings from the division's study on dextroamphetamine (Dexedrine®) and modafinil (Provigil®) enabled the approval of the use of modafinil by U.S. Army aviation forces. Over the years, USAARL has collaborated with Active Signal Technologies, a Small Business Innovation Research partner, on all stages of development of a noise immune stethoscope (NIS). In FY10, WPHD evaluated the ability of medical professionals to detect cardiopulmonary pathology using the NIS in patients in real-world operational environments. The results of this study are forthcoming.

The Warfighter Protection Division (WPD) continued to provide relevant contributions to protecting medical personnel and patients during medical evacuation. They tested and evaluated the performance of 20 medical systems for use during en route care, ensuring the safe interaction among the vehicle, medical systems, patients, and care providers. The division conducted injury analyses on Stryker and MRAP accidents leading to improvements in combat vehicle Soldier restraint. WPD researchers and collaborators from Virginia Tech developed algorithms for the Facial and Ocular Countermeasures Safety (FOCUS) head form (a face/eye injury assessment manikin), allowing for the assessment of the effectiveness of face/eye wear to protect against serious face/eye injury.

During FY10, the Sensory Research Division (SRD) utilized their acoustics expertise to publish an American National Standards Institute/Acoustical Society of America (ANSI/ASA) standard. The standard defines methods to measure the hearing protection of devices designed to protect against impulsive noise. The SRD researchers began evaluating the protection provided by custom-fit earplugs, to ensure these new, highly-requested items meet ANSI/ASA standards and are safe for use by aircrew members. The division continued their research on the impact of repetitive blast exposure on the auditory, vestibular, and visual systems of U.S. Marine Corps breachers.

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Report RCS MED-41 (R4)**

USAARL enjoyed great success with eight enlisted and two officers earning promotions. USAARL supported several overseas missions in FY10: two enlisted completed a mission preparing, staging, and upgrading the long term storage units for both a Combat Support Hospital and Minimal Care Detachment located in Japan; two other enlisted supported the U.S. Army Medical Materiel Agency by conducting an inventory and technical inspection of Army Pre-positioned Sets-Southeast Asia located in Qatar; one officer completed an extended tour in Iraq; and one officer completed a tour in Afghanistan. We were also very well represented at the U.S. Army Medical Research and Materiel Command (USAMRMC) Soldier and non-commissioned officer (NCO) of the year competitions.

Finally, I would like to recognize some of our lab's 'unsung heroes.' While the mission of the lab is unarguably research, and the metrics that bring 'glory' center on publications and presentations, I could not be prouder of our support staff. We made remarkable strides this year in human protection, property accountability and logistics, and programs that take care of our Soldiers and civilian workforce. Our facility underwent much needed renovations to the building infrastructure, including the installation of new air handling and security systems. We adopted a newly mandated accounting and business practices (GFEBS), and continue to improve our Balanced Scorecard.

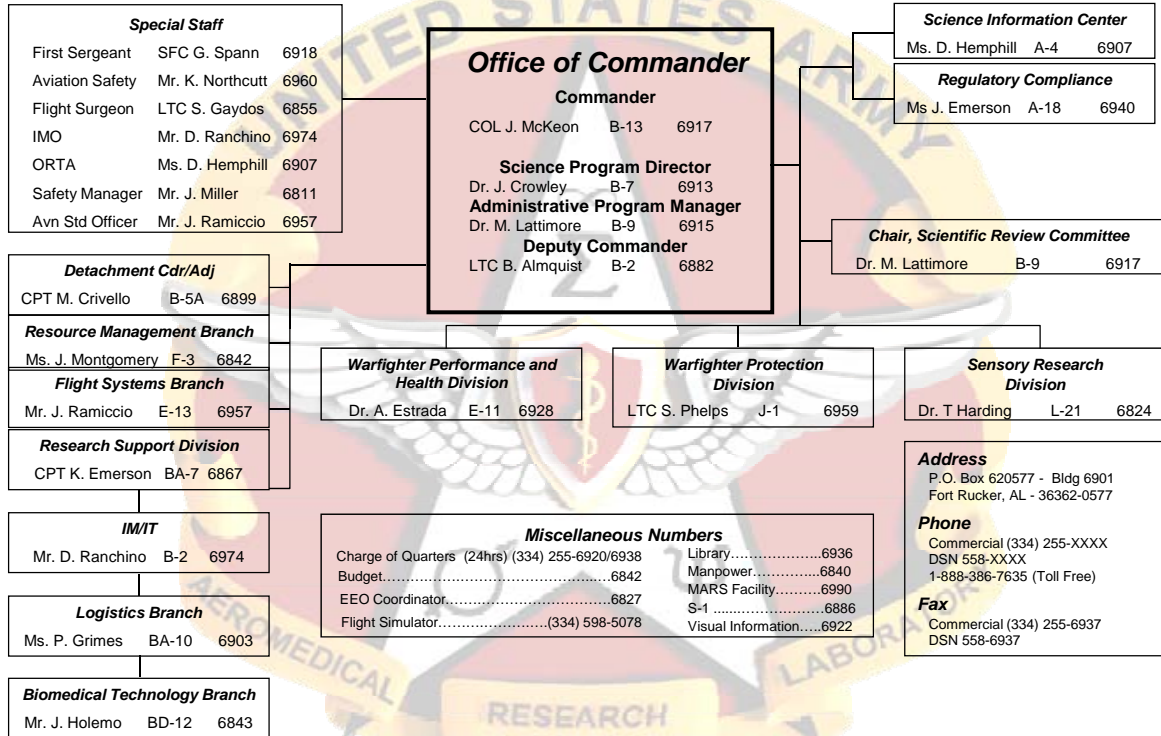
USAARL remains dedicated to supporting the U.S. Army Medical Department's mission to "conserve the fighting strength." We are proud of the work we accomplished this year. During FY11, we will continue to focus our research efforts on protecting the combat Warfighter and supporting the career development of our own Soldiers.



JOSEPH F. MCKEON  
Colonel, Medical Corps  
Commanding

# U.S. Army Aeromedical Research Laboratory — Fiscal Year 2010

## USAARL Organizational Chart



## **U.S. Army Aeromedical Research Laboratory — Fiscal Year 2010**

### **Scientific Programs**

#### **Warfighter Performance and Health Division**

The WPHD is comprised of two branches: the Aeromedical Factors Branch (AFB) and the Cognitive Assessment and Diagnostics Branch (CADB). Together these branches maintain a unique capability in basic and applied research relating to the modern Warfighter. During FY10, the research objectives of WPHD were to develop and document effective means of optimizing the performance of military personnel subjected to stressors such as spatial disorientation; disrupted sleep, work, and rest cycles; high cognitive workloads; and sustained operations. The research also included current and anticipated medical issues related to Warfighter injury prevention and reduction; psychological health and resilience, including traumatic brain injuries (TBI), post concussion syndrome (PCS), return-to-duty (RTD)/fitness-for-duty (FFD) issues, and physiological health. General scientific disciplines included aviation medicine, biomedical engineering, human factors, systemic and neurosensory physiology, and research psychology. Within this heterogeneous framework, the WPHD defined the biomedical impact of prototype and developmental military equipment in terms of individual tolerance and performance effectiveness; assessed emerging technologies in all of the above research fields; and translated these research results into useable, relevant recommendations to the field. The WPHD developed, maintained and actively integrated technology transfer between other Department of Defense (DoD) laboratories and agencies, academia, the civilian scientific sector, and allied countries.

In FY10, the WPHD staff was composed of both military and civilian employees. There were 11 investigators on staff (six Ph.D., two M.D., and three master's-level) with varying specialty areas including physiology, neurophysiology, neuropsychology, cognitive psychology, educational leadership, and human factors. The division staff was complemented by a research program coordinator, four research technicians, three student contractors, and five Soldiers skilled in medically-related fields. Division research included the use of a Black Hawk helicopter, flight simulator, tactile systems, cognitive assessment software tools, and an engagement skills weapons trainer.

#### **Aeromedical Factors Branch**

The AFB's mission is to support the Warfighter by conducting basic and applied research to quantify, attenuate, and mitigate operational stressors. During FY10, the research mission focused on the following areas: crew/operator endurance and sustainment (aviation and ground vehicles), operator workload, collective team performance, situational awareness, motion sickness prevention, and advanced medical diagnostic tools. The AFB objectively and subjectively evaluated strategies to ameliorate the performance decrements and safety issues associated with fatigue and motion sickness through pharmacologic and non-pharmacologic intervention. Ongoing research in emerging tactile technologies and visual displays pursued

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solutions for spatial disorientation and loss of situational awareness experienced during helicopter flight operations in areas of limited visibility/contrast (e.g., “brownout” landings, hovering over snow/desert/water). In addition, new medical devices designed for use in high noise environments and novel equipment designed to aid the rehabilitation of wounded Soldiers were developed, tested, and evaluated for their clinical efficacy and applications. Collaborations were established within the U.S. Army, other U.S. government research agencies, national and international agencies, and civilian universities.

In FY10, AFB projects included the following:

### *A Comparison of the Efficacy of Modafinil and Dextroamphetamine as Alertness Promoting Agents in Aviators Performing Extended Operations*

The objective of this study was to determine the side effect profile and degree to which low doses of modafinil and dextroamphetamine sustain alertness, performance, cognition, vigilance, judgment, mood, and decision-making throughout 40 hours of continuous wakefulness.

### *Aerial Command and Control of Unmanned Aircraft Systems*

The primary objective of this project was to evaluate what aeromedical effects could impair the performance of airborne Unmanned Aircraft Systems (UAS) controllers when they are teamed with manned helicopters.

### *Effects of Ketamine and Morphine on the Performance of Warrior Skill Tasks*

The goal of this study was to compare the ability of Soldiers to perform warrior tasks (representative of Soldier skills) following administration of ketamine and morphine to evaluate the potential utility of low-dose ketamine as a battlefield analgesic.

### *Motion Sickness Prevention by Stroboscopic Environment during Actual Air Transport*

The objective of this study was to evaluate the effectiveness of 8-hertz (Hz) stroboscopic environments in reducing visually-induced motion sickness (retinal slip) during military transport.

### *The Effects of Spatial Disorientation on Working Memory and Mathematical Processing*

The aim of this study was to examine the effects of spatial disorientation on aviators’ cognitive processing in real-time.

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### *Noise Immune Stethoscope*

The NIS – a dual mode electronic and Doppler device – was evaluated on patients with cardiopulmonary pathology in real-world operational environments including a medical center and a U.S. Navy carrier.

### *Tactile Cueing for Rehabilitation following Traumatic Brain Injury*

The goal of this project was to carry out an initial exploration of three different systems for providing tactile sway cueing as a compensatory strategy for patients suffering from disequilibrium due to TBI.

### *Tactile Situation Awareness System*

The objective of this study was to develop capabilities that provide non-visual, intuitive orientation and targeting information to the Warfighter to complement existing situation awareness systems and ensure that awareness of the “big picture” is maintained.

### *A Workload Assessment of Aviation Maneuvers*

The primary objective of this study was to explore a new subjective measure of workload in an effort to move towards an operational definition of the construct.

### *Development of a Fitness-for-Duty Assessment Battery for Recovering Dismounted Warriors*

The purpose of this study was to examine the effects of mild traumatic brain injury (mTBI) on dynamic marksmanship abilities and weapons utilization tasks. The study also served to demonstrate whether a new marksmanship assessment battery can supplement RTD assessment and determinations.

### *Efficacy of Directional Tactile Cues from a Tactile Garment for Target Orientation in Helicopter Extractions over Moving Targets*

The study assessed the efficacy of a tactile cueing system to provide nonverbal, tactile directional cues to the pilot as to the target’s ever-changing position.

### *Team Performance Metrics and their Appropriateness for the U.S. Army: A Systematic Review*

The study conducted a systematic review of team performance metrics to identify those suitable for the Army’s team performance research needs.

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### *A Simple Field Test for Balance Impairment*

The objective of this study was to develop an easily-administered test of vestibular function for use by field clinicians to identify otolithic impairment.

### *The Perception of Looming Tactile Stimuli*

This objective of this study was to determine whether tactile stimuli can convey the approach of significant objects.

### *Studies Project: Touch/Tactile Feedback for Rehabilitation of Wounded Warriors*

This project convened several select study groups of subject matter experts to assess the state of tactile balance feedback systems ultimately making recommendations concerning next generation devices and protocols.

### *Post-Concussion Tools to Assist Assessment, Treatment, and Return to Duty*

This project focused on the development, optimization, and evaluation of prototype balance measurement and cueing systems for the evaluation and rehabilitation of TBI patients experiencing disequilibrium.

### *Hypoxic Hypoxia at Moderate Altitudes*

This systematic literature review was conducted to evaluate the current ‘state of the science’ regarding acute hypoxic hypoxia at moderate altitudes with focus on cognitive impairment, sensory deficits, and other pertinent performance effects.

### Cognitive Assessment and Diagnostics Branch

The mission of the CADB is to enhance the Warfighter’s performance through psychological and physiological health. Today’s combat operations in Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF) have created unique conditions that can have deleterious effects on the cognitive and emotional well-being of our Warfighter. During FY10, the CADB investigated the effects of TBI, sleep deprivation, substance use/misuse (licit and illicit), pre-morbid psychopathology, individual differences, and combat experiences on neuropsychological functioning and psychological health. Clarifying the contribution of specific variables precedes accurate diagnosis, assessment, and the development of efficacious treatments for both TBI and other combat-related psychopathology such as Post Traumatic Stress Disorder (PTSD). It is the goal of CADB to contribute to the proficiency and long-term stability, health and psychological well-being of the Warfighter.

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The FY10, CADB projects included the following:

### *Assessment of Traumatic Brain Injury and Post Traumatic Stress Disorder*

The objective of this study was to assess changes in behavior, cognition, and motivation of Soldiers with chronic symptoms from mTBI/PTSD. This investigation explored the relationships between neuroimaging, neurobehavioral, biological, and psychological measures. It is anticipated that research findings will contribute to RTD standards.

### *Cognition-enhancing Drugs and their Appropriateness for Aviation and Ground Troops: A Meta-analysis*

The goal of this study was to critically review and conduct a meta-analysis of the existing literature in order to identify cognition-enhancing drugs that may be suited for use in ground and aviation troops.

### *The Effect of Sleep Deprivation on Assessment of Causality, Correlation Detection, Illusory Correlation, and Performance on an Engagement Skills Trainer Task in Soldiers*

The objective of this study was to evaluate accuracy on a series of causal judgment tasks and the Engagement Skills Trainer 2000 after a period of sleep deprivation and recovery sleep.

### *Effects of Selective Serotonin Reuptake Inhibitors on Cognition and Sleep*

This study focused on assessing the effects of selective serotonin reuptake inhibitors (SSRI) on the behavior, cognition, motivation, and daytime wakefulness of Soldiers being treated for combat operational stress. The investigation explored the relationship between measures of neurocognitive performance, sleep latency and wakefulness, and sleep quality and quantity.

### *Risky Behavior and Attitudes about Risk in Soldiers Pre- and Post-deployment*

The primary objective of this study was to assess risk propensity in Soldiers pre- and post-deployment. A secondary goal was to assess risk propensity and actual risk behaviors in Soldiers post-deployment; comparisons between those with PTSD, TBI, and poly-traumas.

### *Sleep Disturbances and U.S. Marine Corps Breacher Crewmen*

This study evaluated the sleep patterns (i.e., quantity and quality of sleep) and cognitive functions of U.S. Marine Corps (USMC) breacher crewmen students and instructors before, during, and after training.



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### *Validation of a Weapons Simulator, the Engagement Skills Trainer 2000, as a Measure of Cognitive Performance*

This study investigated the construct validity of a weapons simulator as a measure of cognitive performance using convergent/divergent validation methodology. A secondary goal of the study was to explore relationships between cognitive abilities and marksmanship in an uninjured, healthy sample of U.S. Army Soldiers.

### *Identifying Functional Concussion Thresholds for Cognitive Impairment*

The primary objective of this project was to systematically review the literature regarding performance decrements associated with various impact magnitudes and concussion grades. A secondary objective was to compile a list of currently available measurement technologies.

### *The Effect of Combat Experience on the Perception of Risk in U.S. Army Soldiers Post-deployment*

This study tests the hypothesis that a cognitive impairment associated with combat deployment and TBI is a mechanism driving behavioral changes with regard to health risk in Soldiers post-deployment. Data collected from this study may be useful in developing intervention techniques to decrease the number of preventable injuries and fatalities in Soldiers post-deployment.

### *Brain Imaging of Learning, Memory, and Emotion*

The aim of this study was to investigate the role of various cortical regions in regulating emotional responses to aversive stimuli with use of function magnetic resonance imaging (fMRI). This project was in collaboration with the University of Alabama at Birmingham (UAB).

### *Long-chain Polyunsaturated Fatty Acid Status and Cognitive Performance*

The goals of this research were to assess changes in behavior, cognition, and motivation of Soldiers with chronic symptoms from mTBI/PTSD and to explore the relationship between neuroimaging, neurobehavioral, biological, and psychological measures.

### *The Effects of Controlled Repetitive Blasts on Neuropsychological Functioning*

This study aimed to examine the effects of repeated exposure to blasts in Marine Corps instructors at the USMC Dynamic Entry School (DES). Specifically, the effects of repeated blast exposure on neuropsychological functioning are assessed multiple times annually using a battery of validated neurocognitive tests for a period of 2 years.

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### *Longitudinal Assessment of Determinants of Persistent Post-concussive Syndrome*

The objective of this study was to explore psychological, behavioral, physiological, and genetic factors that may contribute to the development of persistent PCS in Soldiers with a history of combat-related mTBI employing an exploratory, longitudinal methodology.

#### **Warfighter Protection Division**

The USAARL WPD is comprised of three branches, namely the Operational Survival Analysis Branch (OSAB), the Injury Biomechanics Branch (IBB), and the Airworthiness Certification and Evaluation (ACE) Branch. WPD's overall vision is to focus on injury prevention including primary protection in the identification of health hazards, secondary protection in the development of standards for better protective equipment, and tertiary protection in the advancement of mitigating factors in the post-injury phase. The WPD mission is to conduct research on and develop standards for Warfighter injury mechanisms, human tolerance levels, injury risk mitigation technologies and health hazards present in the full spectrum of Army operational and training environments including aviation and ground operations, medical evacuation (MEDEVAC) platforms, combat vehicles and weapons systems.

#### Operational Survival Analysis Branch

The OSAB's research efforts focus on primary protection in the identification of health hazards. The OSAB functions within the framework of the Joint Trauma and Prevention of Injury in Combat (JTAPIC) Program. The JTAPIC Program is administered by the USAMRMC and encompasses multiple organizations as partners; the USAARL contribution focuses on data procurement, analysis, and synthesis. During the past year, USAARL conducted a detailed analysis of vehicle incidents (to include enemy actions and accidents) and personnel injuries.

The U.S. Army continues to face challenges regarding quantifying the performance of protective systems (including personal protective equipment [PPE] and vehicle-mounted safety systems) provided to combat Soldiers. Current U.S. Army military trauma databases, although able to answer myriad questions regarding trauma care, provide virtually no information regarding the circumstances of wounding or the use of protective equipment – lacking even such basic details as to whether the protective system was in use when the injury occurred. Gaps include the lack of data describing the operational environment, as well as no comprehensive mechanism for the collection, examination, or cataloging of damaged protective systems and equipment associated with combat injuries. As a result, program managers (PMs) have no way of knowing how well their products are functioning on the battlefield; they are forced to rely on case reports and anecdotes, combined with sterile laboratory evaluations, when deciding whether to invest in product improvements. Frustrated vehicle and equipment developers have little information on which improvements will provide maximal protection. The USAARL framework provides a reliable estimation of protective system performance in present and future combat operations.

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### *Operational Survival Analysis Section*

The OSAS personnel have continued to be instrumental in developing short notice responses to U.S. Army and other government and non-government customers involving questions about eye protection, ear and hearing protection, as well as helping inform research groups about the distribution and types of wounds occurring in the current conflicts. The OSAS continues to collaborate via secured data and video conference venues with organizations globally. FY10 accomplishments include:

#### Cases Developed:

- 08-01, High Mobility Multipurpose Wheeled Vehicle (HMMWV) turret gunner restraint system; September 2007
- 08-02, HMMWV turret gunner restraint system; April 2008
- 08-03, Assessment of Aviation Life Support System Equipment (ALSE) in a shoot down event
- 08-05, Injury of occupants of HMMWV rollover accidents
- 09-02, Damaged Army Combat Helmet (ACH)
- 09-03, Aviation Shoot Down Assessment Team (ASDAT) CH-47F, OEF, January 2009
- Analysis of combat-related eye injury data and use of eye PPE: The Abbreviated Injury Score as an indicator of PPE use and effectiveness

#### U.S. Army Combat Readiness/Safety Center:

The OSAS continued fostering a cooperative working relationship with U.S. Army Combat Readiness/Safety Center (USACR/SC) at Fort Rucker. This working relationship has specifically been supported, along with the Aviation Life Support Equipment Retrieval Program (ALSERP) staff in providing presentations at USACR/SC's quarterly Aviation Safety Officers' Course (ASOC) and Ground Safety Officers' Course (GSOC).

#### Mine Resistant Ambush Protected Joint Program Office:

The OSAS continued providing support to the Mine Resistant Ambush Protected (MRAP) Joint Program Office with accident data procurement and analysis as well as participating during periodic forums to include the MRAP Joint Users Working Group (JUWG) and MRAP Joint Training Integrated Process Team (JTIPT).

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### U.S. Army Research, Development and Engineering Command Tank Automotive Research, Development and Engineering Center Field Assistance for Science and Technology Team:

The OSAS continued providing support to U.S. Army Research, Development and Engineering Command (RDECOM) Tank Automotive Research, Development and Engineering Center (TARDEC) community and its programs with accident data procurement and analysis as well as participating during monthly Field Assistance for Science and Technology (FAST) Team Update teleconferences and semi-annual FAST Team Orientation and Reach Back Training sessions.

#### *Aviation Life Support Equipment Retrieval Program*

The Aviation Life Support Equipment Retrieval Program (ALSERP) serves a vital role in maximizing the level of protection afforded to Army aircrew members by analyzing aircraft life support equipment (ALSE), studying injury mechanisms, tracking patterns, and bringing awareness to issues that can potentially decrease the level of protection afforded to Army aircrew members. Analyses of equipment and the discovery of deficiencies often prompt core research projects. In FY10, ALSERP supported six USACR/SC Class A mishap investigations and one Installation Accident Investigation (IAI), providing reports on analyses of both ALSERP personnel and ALSE.

Personnel visited BAE in Phoenix, AZ, to meet with individuals involved in the Cockpit Airbag System (CABS) project. The visit served to highlight the developments in the system software and updates required to the current USAARL system for downloading information from the electronic crash sensor unit (ECSU) from mishap aircraft.

Members of ALSERP carried out a study examining downloaded data from ECSUs from currently active aircraft, identifying faults and highlighting aircraft with unnecessarily deactivated units, as well as aircraft with software or hardware faults necessitating replacement. This project was part of ongoing monitoring of the CABS system and its effectiveness.

Personnel from ALSE/ALSERP were involved in meetings to optimize the contents of the ALSE vest and give consideration to the escape and evasion requirements of female aircrew.

ALSERP continues to contribute to the education of military and civilian personnel through presentations and guided tours of USAARL. The department hosts regular visits from the aviation safety officer, ground safety officer, and flight surgeons courses. ALSERP personnel are constantly working to improve the quality and standards of visual aids and equipment used in these teaching sessions.

Members of ALSERP are active in research examining mishap trends and the contribution of safety equipment to prevention of injury.

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### **Injury Biomechanics Branch**

The IBB's research centers on the impact of a full spectrum of Army operational and training environments of Warfighters. The IBB is uniquely staffed with a multi-disciplinary team of biomechanical and aeronautical engineers, aviators, aerospace medicine specialists, safety professionals, and Soldiers. The team studies the effects of exposure to physical forces (e.g., localized and whole body impacts as well as repeated jolt) on the health, safety, and performance of U.S. Army aviation and ground, mounted, and dismounted Warfighters. The IBB team uses various standardized and unique methods (e.g., epidemiological research, computer modeling, laboratory simulation, crash manikins and human volunteers, mishap investigations of combat ALSE studies, and the investigation of ground vehicular incidents). It also uses tools such as the helmet vertical drop tower, the Multi-Axis Ride Simulator (MARS), and the NUH-60 Black Hawk Simulator. IBB team members serve on various inter-governmental and multi-national biodynamics research working groups that seek to develop internationally-recognized, biomechanically-validated injury standards. These groups recommend injury prevention and protection strategies to researchers, equipment developers, and major commands.

### ***Neurosensory Injury Prevention Program***

The Neurosensory Injury Prevention Program received an additional focus with start of the Army Technology Objective (ATO) R.MRM.2010.06 Cervical SPine INjury Evaluation (CSPINE). The CSPINE efforts include collaboration with Medical College of Wisconsin, Wright State University, Harvard/Massachusetts Institute of Technology (MIT) Beth Israel, University of Pennsylvania, and Naval Air Systems Command (NAVAIR). CSPINE research will provide the capability to assess neck response to chronic and acute exposures occurring in high risk military environments.

The IBB team also worked closely with JTAPIC, PM-Soldier, Aberdeen Test Center (ATC), U.S. Army Natick Soldier Research Development and Engineering Center (NSRDEC), Naval Health Research Center (NHRC), Duke University, Henry Jackson Foundation (HJF), and Applied Research Associates (ARA) to evaluate combat helmets and combat helmet sensor systems. USAARL researchers collaborated with researchers from Duke University and ARA to perform simulated blast events with shock tubes and live explosives to evaluate the fielded helmet mounted sensor systems. Additionally, combat helmet responses were characterized through collaborative efforts with Duke, ARA, and HJF using laboratory grade sensors attached to blast-exposed and blunt-impacted ACHs.

The IBB team continued to support PM-Apache in its development and maturation of an Apache-specific variant of the HGU-56/P flight helmet. IBB evaluated the effect of trimming the lower 0.5 inch of helmet shell material from the eardome regions of the HGU-56/P on the lateral impact protection which is directly related to protection against basilar skull fractures. IBB's research showed the lateral blunt impact protection of the HGU-56/P to be unaffected by trimming the helmet shell material from the eardome.

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The development of injury risk functions relating impact forces, measured using the FOCUS head form, to the risk of facial fractures during lateral impacts continued throughout FY10. In early FY10, IBB collaborators at the Virginia Tech-Wake Forest Center for Injury Biomechanics (CIB) received USAMRMC Human Subjects Research Review Board (HSRRB) approval to conduct facial fracture research using post-mortem human subjects (PMHS). Lateral blunt impact to the mandible, nasal bone, and zygoma of 20 PMHS tests were conducted in mid-FY10; for each test, impactor acceleration and impact force were measured, as was acoustic emission data needed for determining the onset of fracture. In the upcoming year, IBB researchers will conduct matched testing using the FOCUS head form; data from the matched tests will allow loads measured by the FOCUS head form to be correlated to risk of zygoma, nasal bone, and mandible fracture. These injury risk functions will become part of a comprehensive set of facial fracture injury risk functions for use by combat developers and materiel evaluators.

An IBB-initiated, USAMRMC Military Operational Medical Research Program (MOMRP)-funded research project to develop low level eye injury risk functions for use with the FOCUS head form was completed in FY10. IBB collaborators at the Virginia Tech-Wake Forest Center for Injury Biomechanics and Bucknell University developed biomedically-valid mathematical models that relate the force measured in the synthetic eye of the FOCUS head form to the risk of hyphema, lens damage, and retinal damage. Additionally, an existing injury criterion for predicting the risk of globe rupture as a function of force was refined. The final report from this research effort was delivered to USAARL in September 2010.

Throughout FY10, IBB researchers supported the NSRDEC's Warfighter Protection and Aerial Delivery Directorate in the development of a humanitarian ration that can be dropped over populated areas. The IBB team provided information on injuries that could result from impacts of falling rations to the human head, face, neck, and torso, as well as synopsis of related injury metrics for these anatomical regions. Additionally, IBB researchers developed the capability of firing existing and novel rations at a FOCUS head form in a controlled and reproducible manner. Face and eye impact load data, as well as head accelerations and upper neck load data, were collected during each ration impact. These data are being analyzed to provide NSRDEC's aerial delivery experts with ration descent velocities that minimize the risk of potential injury.

In the Spring of 2010, IBB scientist were awarded funding through the FY10 Intramural Defense Medical Research and Development Program for Applied Research and Advanced Technology Development for a three-year effort to integrate experimental and computational methods to investigate blast wave brain biomechanics that will support design efforts to improve helmet protection under blast exposure. This research entitled, "Integrated experimental and computational framework for the development and validation of blast wave brain biomechanics and helmet protection" is in collaboration with CFD Research Corporation and ARA.

During Summer 2010, IBB scientists and University of Virginia researchers were awarded funding through the FY10 Extramural Defense Medical Research and Development Program (DMRDP) Applied Research and Advanced Technology Development Award for a three-year effort to investigate lower extremity injuries due to blast, entitled "Investigation of Injuries to

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Armored Vehicle Personnel Subject to Blast: Preliminary Study with Emphasis on Lower Extremity Fractures.”

In late FY10, IBB researchers exposed a FOCUS head form to a series of free-field blasts. The purpose of this test series was to assess the influence of helmets and eye protection devices (ESS goggles and spectacles) on face and eye loads. Forces in the facial bones and eyes were measured for a range of charge sizes, as were head acceleration, head angular velocity, and forces and moments experienced at the upper neck. Data analysis is ongoing. Initial assessments show that facial armor can reduce loads measured in the eye, thus reducing the risk of eye injuries.

During FY10, the IBB team continued close working relationships with Live Fire Test & Evaluation (LFT&E) community, including the Army Research Laboratory, Survivability/Lethality Analysis Directorate (ARL/SLAD) and the TARDEC. These three organizations collectively became known as the Joint Accelerative Injury Working Group (JAIWG). The JAIWG’s collaborative efforts included research and testing work with NSRDEC, Panther Indy League Racing Team, PM-Soldier Protection and Individual Equipment (PM-SPIE), Joint Combat Assessment Team (JCAT) Threat Weapons and Effects Seminar (TWES), Joint Program Office Mine Resistant Ambush Protected (JPO MRAP), and Director, Operational Test and Evaluation (DOT&E). The JAIWG proposed a multi-year effort to explore injury criteria and improved test surrogates for the mounted occupant during blast loadings of the combat vehicle. To improve the understanding of the mounted occupant environment and exposures, the JAIWG planned the first of a series of generic hull blast events to gather public-release data for use by industry and academic leaders in the field of injury biomechanics and human surrogate design and fabrication.

Several years ago, the IBB team was successful in acquiring key research equipment and the internationally-recognized biodynamics data repository from the Naval Biodynamics Laboratory (NBDL) in New Orleans, LA. The NBDL equipment and repository data were scheduled to be decommissioned and/or destroyed due to defunding and damage to the facility by Hurricane Katrina in the fall of 2005. Through the IBB’s long-cultivated collaborations with the U.S. Navy research community and with academia, the USAARL secured and assumed control of this national asset. Working with USAARL, Fort Rucker, and USAMRMC facilities divisions, approval was obtained for a location for the building that will house the vertical acceleration tower (VAT) that was acquired from the NBDL (The VAT was refurbished in FY09.). The building design process was initiated at the end of FY10. The refurbishment process for the horizontal acceleration sleds and supporting equipment began. Also during FY10, IBB continued safely archiving the NBDL data repository for ongoing digitization and eventual utilization by biodynamics researchers world-wide.

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### *Aviation Life Support Equipment*

The objective of the ALSE section is to collect and analyze safety and protective equipment used or considered for use in U.S. Army aviation (and/or other DoD and non-DoD entities). Furthermore, this program is involved in the evaluation of aircraft interiors and other human factors issues within crew spaces. Results from this section frequently identify unforeseen or previously unrecognized gaps in deployed equipment subsystems, in levels of human tolerance, and/or in current protection research, and as such are evaluated and transitioned into the core research program at USAARL and at the DoD-level through USAARL's close associations with other research and development entities as well as through various PMs and combat developers.

In FY10, the USAARL ALSE team participated in several projects, including the development, qualification testing, and fielding of the ZETA II helmet liners, Survival Kit, Readiness Access Modular (SKRAM) kit, and the KA-BAR and Ontario Knife Source Selection study. USAARL's ALSE team led the assessment of the KA-BAR and Ontario Knife Source Selection study and the SKRAM kit for aviation survival use. Major modifications were recommended and implemented on the advice of Survival Evasion Resistance Escape (SERE) School Staff and USAARL senior aviator/subject matter expert (SME) team members, resulting in a knife and survival kit that will be more fully suited for the assigned tasks and expectations for its intended use. USAARL's ALSE team was an advocate for development, production, and fielding of fire protective clothing for aircrew and has continuously emphasized the need for the development of the Fire Resistant Environment Ensemble (FREE).

The ALSE section continued its highly successful helmet problems fit program, discovering over 30 custom helmet fitting solutions in FY10, and continues to monitor customer satisfaction.

### Airworthiness Certification and Evaluation Branch

The ACE Branch maintains the unique capability of testing and evaluating the efficacy of medical systems in the U.S. military aeromedical evacuation environment, ensuring the safe interaction among medical equipment, patients, aircrew, and aircraft. As such, the ACE Branch contributes to the protection of the injured or ill Warfighter through the medical evacuation (MEDEVAC) system.



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### *Test and Evaluation Program*

Under the aegis of the ACE Branch and at the request of the U.S. Army, U.S. Air Force (USAF), U.S. Navy, and USMC, airworthiness testing and/or certification was completed in FY10 for five items of medical carry-on equipment for use aboard all H-series MEDEVAC helicopters. Currently, there are 11 medical equipment items being tested, and at the request of all other services, an additional 25 items are planned for testing in FY11, including certifying a full spectrum of medical carry-on items for the LUH-72 Lakota. The USAF testing laboratory at Brooks City-Base, San Antonio, TX, accepted ACE test data for multiple medical items. This interaction has streamlined the joint certification process.

In FY10, the ACE Branch continued to collaborate with the USMC. Through this coordination, the ACE Branch performed test and evaluation on eight medical equipment items in the laboratory ensuring satisfactory operation in the military medical environment. This collaborative effort directly supported critical procurement decisions fielding some of the most advanced medical technology to the war fighter in support of OEF/OIF and other military operations.

The ACE Branch gave formal presentations on test program updates at the Defense Medical Materiel Program Office (DMMPO), Test, Evaluation, and Standardization Working Group meeting as well as the Global Patient Movement Joint Advisory Board (GPMJAB), sponsored by the U.S. Transportation Command (USTRANSCOM). During both meetings, ACE interfaced with key board members to understand joint medical service requirements.

In response to a request from the U. S. Army Medical Materiel Agency (USAMMA), the ACE Branch performed airworthiness testing on the NIS. This item addresses a need for an electronic stethoscope capable of distinguishing heart and lung sounds in the noisy environment of a helicopter during medical evacuation. Vibration, electromagnetic interference, and climatic tests were conducted on the NIS. In FY11, explosive atmosphere, rapid decompression, electromagnetic susceptibility, flight testing, and user evaluation will be conducted.

### *Standards Development Program*

Based on a tri-service meeting on patient movement items (PMI) testing held at USAARL, the ACE Branch finalized a draft of the Joint En Route Care Equipment Testing and Certification Standard (JECETS). The JECETS document addresses revisions to the existing Joint Airworthiness Certification (JAC) requirements document to include ground and sea environments. Several changes to the JAC document were based on ACE Branch interaction with the Military Standard 810 (MIL-STD-810) working group and close collaboration with the USAF. The ACE Branch continues to participate in MIL-STD-810 working group meetings to validate current ACE test methodologies and to discuss future inclusion of JECETS requirements into MIL-STD-810.

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In FY10, the ACE Branch incorporated a test methodology aimed to increase aviation safety. A unique testing apparatus was fabricated to determine if a test article of high mass would hold its spatial position relative to the occupants under high acceleration/crash loads.

The ACE Branch partnered with the American Standardization for Testing and Material (ASTM) F30 Committee to develop a civilian test standard for en route care equipment. During FY10, two meetings were held with participation from the medical device industry and various government agencies.

ACE personnel continue to be extensively involved with the Air and Space Interoperability Council (ASIC) aimed at developing new standards, which allow for international acceptance of medical carry-on items onboard host-nation platforms. The five ASIC nations (i.e., United States, United Kingdom, Canada, Australia, and New Zealand) also shared commonalities and interoperability issues experienced during tactical and strategic aeromedical operations.

### *Research Activities*

The ACE Branch hosted a meeting at USAARL for a working group of the Association for the Advancement of Medical Instrumentation (AAMI SP10) concerned with eliminating or mitigating motion artifact from medical monitoring devices. Attendees had a particular interest in the man-rated six degree-of-freedom ride simulator at the MARS facility. Discussion centered on using the simulator as a testing platform for evaluating medical monitoring devices that claim to eliminate motion artifact.

### Shock and Vibration Isolation System for Patient Litters

Personnel in the ACE Branch were involved in an ongoing effort to identify and develop shock and vibration isolation systems for patients during ground and air MEDEVACs. In late FY10, the ACE Branch started collaborating with the University of Nevada Las Vegas (UNLV) using a modified existing air bladder technology to fit under supine litter patients and seated patients. This effort was funded by the U. S. Army Medical Materiel Development Activity (USAMMDA). A portion of the funds were directed to the ACE Branch for the test and evaluation of the shock and vibration isolation systems using the MARS and field testing on military MEDEVAC platforms.

A test team composed of USAARL and UNLV personnel traveled to Fort Detrick, MD to evaluate seated and supine prototypes of the modified air bladder technology. Mechanical shock and vibration data was collected on an RG-33L MRAP ambulance that is stationed at the USAMMDA test facility. Data were collected with and without the air bladder technology during simulated patient transport over various terrain types. Preliminary analysis indicated the air bladders provide shock and vibration attenuation in key frequency ranges.

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In FY10, the ACE Branch continued to broaden its development of an accelerated process to assist several medical device companies to test product modifications at regional civilian test laboratories. Three medical carry-on items were tested in FY10 using this novel strategy.

### *Quality Assurance Milestones*

In FY10, the ACE Branch initiated quality milestones per ANSI/ISO/IEC 17025 (General Requirements for Competence testing and Calibration Labs and ISO 9001 Laboratory Accreditation Program Requirements).

## **Sensory Research Division**

### **Visual Sciences Branch**

The SRD maintains a unique capability in the visual sciences as they relate to military operational medicine. The Division builds on its expertise in the clinical and allied vision sciences to enhance Warfighter effectiveness and safety in the evolving battlefield environment of today. The Division's vision science, optical, clinical, and technological capabilities provide a basis for the development and integration of optical and electro-optical displays in military systems; the evaluation physical, physiological, and functional vision associated with military occupational demands and combat, the definition of countermeasures to improve and preserve vision and visual efficiency, particularly as applied to unaided visual target detection, recognition, and identification. Of particular concern are the evolving threats to the visual system posed by battle field blast injuries.

### *Sensory Biomarkers for Traumatic Brain Injury*

It is generally agreed that more than 70% of brain processing involves the visual system and the cognitive processes associated with visual perception. This creates the potential for vision to serve as an indicator of the integrity of the brain. Current research is directed toward developing the rich potential of vision as a tool for assessing and diagnosing the effects of mTBI. Thus the assessment of vision provides insight into the effects of mTBI on the ability of patients/Warfighters to see at the same time that the assessment provides insight into the effects of the trauma on the brain.

### *Advanced Optical Measurement and Correction*

The objective of this research was to determine the operational efficacy of refractive surgery for specialized Army applications. However, higher order aberration of the eye, as well as corneal physiological modeling, are currently being investigated to enhance visual performance to 20/8 or better. If found safe and effective, these techniques will provide the capability to increase the recruitment population, enhance visual performance levels, and potentially increase future mission success in visually demanding military occupational specialties.

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### *Oculometrics and Other Sensory Indices of Alertness, Fatigue, and Time-on-Task*

This research aims to assess biologic indices of Warfighter FFD using real-time measurements that could be incorporated into the Warfighters' battledress. Research is directed for the simultaneous measurement of an operational task (e.g., rotary wing hover performance) with biologic measures to yield correlational indices of fatigue, alertness, and operational performance.

### *Primary Blast Wave Effects on Ocular Components and Protective Optical Surfaces*

Military personnel working in the combat zones are at particular risk of ocular damage caused by blasts. The spectrum includes penetrating eye injury, retinal detachment, eye rupture, intraocular hemorrhage, and corneal lacerations. Most investigations and models of eye injuries have focused on such secondary mechanisms of ocular blast injury, however a spectrum of eye injuries may be due to primary blast overpressure. In this study investigates: (a) the relationship between blast-produced ocular damage and the use of Military Combat Eye Protection (MCEP); (b) the primary blast overpressure and its affect upon ocular structures and the integrity of MCEP; (c) the level of primary blast overpressure protection provided by MCEP in order to differentiate blast effective design properties.

### *Combat Eye Protection to Preserve Visual Sensitivity of Warfighters during Abrupt Changes in Lighting Conditions*

Breaching into buildings from bright daylight into the dark interior puts our Warfighters at a visual disadvantage. The vision of individuals inside the building has already adapted to that illumination level while the vision of our Warfighters is impaired. Currently our Warfighters have two options to minimize their visual disadvantage: they either have to remove their combat eye protection or use clear lenses in their combat eye protection. Neither of these options is satisfactory. Removing the eye protection presents obvious risks, but using clear lenses in a bright environment greatly reduces their ability to subsequently fight in a darkened interior. The goal of this project is to provide Warfighters with better options, by evaluating technologies that may be effective in eye protection that facilitates visual transition between dim and bright illumination environments. The findings will provide design guidance for eye protection that will allow continuous uninterrupted use between bright and dark environments. Increasing the use of protective eyewear by ground Warriors enhances their safety and facilitates mission completion.

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### *Effects of Repetitive Blast Exposure on Visual System*

Traumatic injuries as the result of blast are very common during the current conflicts in Iraq and Afghanistan. Warfighters are exposed to high-level blast overpressures that can cause a variety of injuries from primary blast effects. However, the effects of repetitive primary blast exposure to the ocular structures and visual system have not been studied in detail. This research intends to evaluate the effects of repeated blast exposure on the instructor cadre at the USMC Weapons Training Battalion (WTB) DES in Quantico, VA. The purpose of this research protocol is to evaluate the ocular and visual changes among cadre during assignment to the school. This will be done by assessing visual functions and ocular structure integrity over the course of their assignment. Comparisons will be made to help identify the hazards to the eye structure, as well as the effects on visual functions that are associated with exposure to repeated high-level blasts. This will also begin to define the recovery, adaptation, and compensation of sensory decrements, as well as ocular structural damage, resulting from primary blast.

### *Advanced Display Concepts and Physiological Optics*

This research will improve image output standards to optimize visual performance with advanced electro-optical designs and visual performance models to predict Warfighter performance in operational environments. The National Research Council, in its review of tactical displays for Warfighters, identified a major weakness in the understanding of human factors related to perceptual and cognitive issues with such devices.

### *Visual Performance Modeling*

The objective of this research was to develop computer models of human physiology and performance and models of military hardware and operational stressors to assess human performance in an operational environment. Models of interest include health hazards of impulse noise from crew-served weapon systems; HMD and head-up display (HUD) models for day-night operations; target detection and identification models; and sensory processing models.

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### **Acoustics Research Branch**

The SRD maintains a unique capability in acoustics research. The objectives of the Acoustics Research Branch (ARB) are to conduct research to improve the operational capabilities of Army aviation, mounted, and ground forces by predicting and reducing hazards from excessive exposure to noise, and to improve the safety and mission capabilities of Army personnel by improving the auditory displays and communications systems utilized in military aircraft and ground vehicles. Warfighters' survivability depends on accurate sensory perception of the environment. Despite the technological advances in hearing protective devices, the likelihood of exposure to continuous and impulse noise on the modern battlefield remains high. As a result, the prevalence of hearing loss and tinnitus in returning OIF and OEF Soldiers is at an all-time high; making protection of the critical sense of hearing a priority of the ARB. Warfighter auditory performance research efforts focus on prevention of noise-induced hearing loss and enhancement of auditory performance. Furthermore, research efforts are focused on evidence-based criteria for standards to determine the level of operational competence required to RTD following an auditory or vestibular injury.

#### *Hearing Hazards in Army Operations*

This program investigates and evaluates hazards to hearing in the Army operational environment. Principally, this includes noise in rotary-wing and mounted environments but also includes impulse noise hazards for mounted and dismounted Warfighters, which is measured using specifications of MIL-STD-1474D "Noise Limits." In rotary-wing environments, noise measurements are made on both sides of the pilot's head and at the unoccupied copilot (observer) position at approximate head height during specific flight maneuvers and aircraft configurations. Measurements are also made during weapon firing to measure impulsive noise. An example of quantifying a dismounted operational environment would be the measurement of blast overpressure at the USMC WTB DES. Furthermore, while the most common hazard to hearing is high-level continuous and impulse noise, other hazards may include ototraumatic and ototoxic agents such as inhalants, disease, and drugs.

#### *Hearing Protection and Enhancement for the Warfighter*

This program focuses on traditional and advanced technologies and systems to enhance hearing while protecting the vital survival sense of hearing in the combat environment. As stated previously, exposure to dangerous levels of combat noise is causing an epidemic of high rates of acute and chronic acoustic injuries. New technologies can prevent most of these injuries while preserving combat effectiveness. Non-linear hearing protection and communication systems provide the dismounted Warfighter with hearing protection and communication while still allowing enhanced situational awareness of the battlefield and face-to-face and wireless communications. Non-linear hearing protective devices permit normal or near-normal hearing during periods of quiet or low-level noise while providing protection from the very high impulse noises generated by friendly or opposing forces weapon systems. Research is focused on laboratory evaluations of commercial off-the-shelf (COTS) non-linear hearing protection and

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communication systems and includes quantification of hearing protection, speech intelligibility, sound localization, and signal detection and recognition.

### *Auditory Performance in Army Tactical Environments*

This program encompasses research on human auditory performance, typically in noise, by normal and hearing-impaired listeners. The objective is to enhance the safety and operational mission capabilities of Warfighters by evaluating new hearing protection and enhancement technologies for use by normal hearing and hearing-impaired listeners. Additional research in this area examines a novel tinnitus treatment to reduce the debilitating operational effects of tinnitus resulting from blast and other acoustic trauma.

### *Bioacoustics and Noise Standards*

The program emphasizes collaborative work in conjunction with the ASA's standards working groups on acoustical hazards and hearing protection measurement methods. Several ARB personnel serve on various standards working groups. The current ANSI method for testing the effectiveness of hearing protective devices was developed with participation by USAARL investigators. The ARB has engaged in a multi-laboratory, multi-national research program that has resulted in the revision of standard ANSI S12.6 Methods for Measuring the Real-Ear Attenuation of Hearing Protectors.

### *Sensory Biomarkers for Traumatic Brain Injury*

Nearly 80% of the brain's processing involves sensory signals and cognition associated with sensory perception. In-house research is directed at finding electrophysiological and/or performance indices that may provide early diagnosis of mTBI. Recent projects are evaluating the ability of electrophysiological brainstem measures to differentiate brain-injured Soldiers from those without brain injuries. Similarly, research is being focused toward the development of vestibular and oculomotor biomarkers of traumatic brain injury to aid in the development of RTD standards.

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### Research Activities

#### Publications

##### Open Literature Articles

- Ahroon, W. A., Hill, M. E., & Goodes, D. P. (2011). Analysis of Army-wide hearing conservation database for hearing profiles related to crew-served and individual weapon systems. *Noise and Health, 13*(50), 76-83.
- Brady, S. M., Gaydos, S. J., & Berry K. A. (2010). Development and assessment of a dual-mode, noise-immune stethoscope for combat environments. *Use of Advanced Technologies and New Procedures in Medical Field Operations*. North Atlantic Treaty Organization (NATO) Research and Technology Organization (RTO) Human Factors and Medicine (HFM) Panel HFM-182. Retrieved from <http://ftp.rta.nato.int/public//PubFullText/RTO/MP/RTO-MP-HFM-182//MP-HFM-182-35.doc>
- Gaydos, S. (2010). Sublingual immunotherapy for allergic rhinitis. *Federal Air Surgeon's Medical Bulletin, 48*(1), 8-9.
- Harding, T. H., Rash, C. E., & Lang, G.T. (2010). Perceptual and cognitive affects on the use of helmet-mounted displays due to external operational factors. In Marasco, P. L., & Havig, P. R. (Eds.), *Proceedings of the International Society for Optical Engineering (SPIE): Vol. 7688. Head- and Helmet-Mounted Displays XIV: Design and Applications*. (pp. C1-C12). Bellingham, WA: SPIE.
- Harrison, M., Neary, J., Albert, W., Kuruganti, U., Croll, J., Chancey, V., & Bumgardner, B. (2009). Measuring neuromuscular fatigue in cervical spinal musculature of military helicopter aircrew. *Military Medicine, 174*(11), 1183-1189.
- Hewett, K. J., Curry, I. P., & Gaydos, S. J. (2010). Subtle cognitive effects of moderate hypoxia. *International Journal of Applied Aviation Studies, 10*(1), 249-259.
- Killgore, W. D., Kelley, A. M., & Belkin, T. (2010). So you think you're bulletproof: development and validation of the Invincibility Belief Index (IBI). *Military Medicine, 175*, 499-508.
- Lawson, B. D., & Rupert, A. H. (2010). Vestibular aspects of head injury and recommendations for evaluation and rehabilitation following exposure to severe changes in head velocity or ambient pressure. In Turan, O., Bos, J., Stark, J., & Colwell, J. (Eds.), *Proceedings of the International Conference on Human Performance at Sea (HPAS)*. (pp. 367-380). Glasgow, U.K.: University of Strathclyde.



## U.S. Army Aeromedical Research Laboratory — Fiscal Year 2010

- McIlwain, D., & Hill, M. (2009, November 24). Promote practice diversity. *Advance for Audiologists*. Retrieved from <http://audiology.advancweb.com/Article/Promote-Practice-Diversity.aspx>
- Reeves, E. R., Randolph, R. F., Yantek, D. S., & Peterson, J. S. (2009). Noise control in underground metal mining. *NIOSH Information Circular, December*, 9518.
- Temme, L. A., Still, D. L., & Acromite, M. T. (2010). Hypoxia and flight performance of military instructor pilots in a flight simulator, *Aviation Space and Environmental Medicine*, 81(7), 654-659.
- Wang, Z., Yang, H., Zhang, F., Pan, Z., Capo-Aponte, J., & Reinach, P. S. (2009). Dependence of EGF-induced increases in corneal epithelial proliferation and migration on GSK-3 inactivation. *Investigative Ophthalmology & Visual Science*, 50(10), 4828-4835.
- Webb, C., Estrada, A., & Athy, J. (2009). Motion sickness prevention by stroboscopic environment during simulated military transport. *International Journal of Applied Aviation Studies*, 9(2), 181-196.
- Yang, H., Wang, Z., Capó-Aponte, J. E., Zhang, F., Pan, Z., Reinach, P. S. (2010). Epidermal growth factor receptor transactivation by the cannabinoid receptor (CB1) and transient receptor potential vanilloid 1 (TRPV1) induces differential responses in corneal epithelial cells. *Experimental Eye Research*. 91(3), 462-471.
- Open Literature Abstracts
- Athy, J. R., Gabauer-Hitzig, A., & Jones, H. (2010). Aerial command and control of unmanned aircraft systems. *Aviation Space and Environmental Medicine*, 81(3), 256.
- Curry, I. P., Walters, L. & Lang, G. (2010). What we give them and what they actually use, An examination of aircrew life support equipment on operations with UK aircrew in Afghanistan. *Aviation Space and Environmental Medicine*, 81(3), 243.
- Gaydos, S. J., Powell-Dunford, N. & Porter, H. (2010). Disseminated Lyme Disease: Lyme with a Twist. *Aviation Space and Environmental Medicine*, 81(3), 258.
- Kelley, A. M., Webb, C., Athy, J., & King, M. (2010). The effect of sleep deprivation on the detection of correlational relationships and friend/foe detection judgments using a weapons simulator. *Aviation Space and Environmental Medicine*, 81(3), 248.

**U.S. Army Aeromedical Research Laboratory — Fiscal Year 2010**

- Przekwas, A., Reeves, D., Zhou, A., Tan, X. G., Chen, Z. J., & Chancey, V. C. (2009). High-fidelity and compact modeling for bone conduction communication systems. *Proceedings of the American Society of Mechanical Engineers International Mechanical Engineering Congress and Exposition, Track 2-3-3* (IMECE2009-12954). Retrieved from <http://www.asmeconferences.org/Congress09/TechnicalProgramOverview.cfm>.
- Przekwas, A., Tan, X.G., Chen, Z. J., Zhou, A., Reeves, D., Wilkerson, P., Yang, H. Q., Harrand, V., & Chancey, V. C. (2009). Techniques in finite element modeling of helmeted-head biomechanics. *Proceedings of the American Society of Mechanical Engineers International Mechanical Engineering Congress and Exposition, Track 2-11-1* (IMECE2009-12955). Retrieved from <http://www.asmeconferences.org/Congress09/TechnicalProgramOverview.cfm>.
- Przekwas, A., Tan, X. G., Chen, Z. J., Zhou, A., Reeves, D., Wilkerson, P., Yang, H. Q., Harrand, V., & Chancey, V. C. (2009). Computational modeling of helmet structural dynamics during blunt impacts. *Proceedings of the American Society of Mechanical Engineers International Mechanical Engineering Congress and Exposition, Track 2-11-1* (IMECE2009-12958). Retrieved from <http://www.asmeconferences.org/Congress09/TechnicalProgramOverview.cfm>.
- Shender, B. S., Paskoff, G. R., Chancey, C., Schmidt, A. L., Austermann, A. E., & Vasquez, K. B. (2010). Gender-based differences in kinematic response to the catapult phase of ejection. *Aviation Space and Environmental Medicine*, 81(3), 209.
- Paskoff, G. R., Shender, B. S., Chancey, C., Schmidt, A. L., Austermann, A. E., & Vasquez, K. B. (2010). G-onset rate differences in kinematic response to dynamic +z-axis loading. *Aviation Space and Environmental Medicine*, 81(3), 225.
- Reinach, P. S., Wang, Z., Yang, H., Capó-Aponte, J. E., Wolosin, J. M. (2010). ERK-DUSP5 interactions specifically control the EGF proliferative effect in primary and SV40-immortalized corneal epithelial cells. *Proceedings of the Association for Research in Vision and Ophthalmology Annual Meeting*, 695/D798. Retrieved from <http://www.abstractsonline.com/Plan/start.aspx>
- Still, D. L., Temme, L. A., & Acromite, M. T. (2010). Quantifying the effects of hypoxia and its countermeasures on the flight performance of military aviators in a simulator. *Aviation Space and Environmental Medicine*, 81(3), 284.
- Temme, L. A., Still, D. L., Reeves, D., & Browning, R. (2010). The use of the Reduced Oxygen Breathing Device (ROBD) in a general civilian sample: Pulse oximetry means and ranges. *Aviation Space and Environmental Medicine*, 81(3), 240.

## U.S. Army Aeromedical Research Laboratory — Fiscal Year 2010

- Wang, Z., Wolosin, J. M., Yang, H., Capó-Aponte, J. E., Reinach, P. S. (2010). Changes in JNK-1 phosphorylation status modulate IL-6 and IL-8 responses induced by TRPV1 in human corneal epithelial cells. *Proceedings of the Association for Research in Vision and Ophthalmology Annual Meeting*, 5899/A94. Retrieved from <http://www.abstractsonline.com/Plan/start.aspx>
- Webb, C. M., Estrada, A., Kelley, A. M., & Ramiccio, J. G. (2010). The effect of spatial disorientation on working memory and mathematical processing. *Aviation Space and Environmental Medicine*, 81(3), 313.
- Wood, S. J., Clarke, A. H., Rupert, A. H., Harm, D. L., & Clement, G. R. (2010). Modification of otolith-ocular reflexes, motion perception and manual control during variable radius centrifugation following space flight. *Aviation Space and Environmental Medicine*, 81(3), 215.
- Yang, H., Wang, Z., Capó-Aponte, J.E., Wolosin, J.M., Reinach, P.S. (2010). DUSP6/MKP3 Overexpression in Corneal Epithelial Cells Inhibits EGF-induced Erk1/2, NKCC1 Phosphorylation and Cell Proliferation. *Proceedings of the Association for Research in Vision and Ophthalmology Annual Meeting*, 694/D797. Retrieved from <http://www.abstractsonline.com/Plan/start.aspx>

### Technical Reports

- Schmidt, A., Austermann, A., Vasquez, K., Shender, B., & Chancey, V. (2009). *Establishing the Biodynamics Data Resource (BDR): Human Volunteer Impact Acceleration Research Data in the BDR*. (Report No. 2010-01). Fort Rucker, AL: U.S. Army Aeromedical Research Laboratory. (Defense Technical Information Center No. ADA511523).
- Kelley, A., Killgore, W., Athy, J., & Dretsch, M. (2009). *Risk Propensity, Risk Perception, and Sensation Seeking in US Army Soldiers: A Preliminary Study of a Risk Assessment Task Battery*. (Report No. 2010-02). Fort Rucker, AL: U.S. Army Aeromedical Research Laboratory. (Defense Technical Information Center No. ADA511524).
- Hayes, J., Hall, B., Bowers, B., Eshelman, R., & Barazanji, K. (2009). *Test and Evaluation of Three Separate Patient Warming Systems (PAWS)*. (Report No. 2010-03). Fort Rucker, AL: U.S. Army Aeromedical Research Laboratory. (Defense Technical Information Center No. ADB355386).
- Hayes, J., Eshelman, R., Hall, B., Holemo, F., Ramiccio, J., & Khalid Barazanji. (2009). *Rotary-Wing Airworthiness Certification Evaluation of the Pulmonetics LTV-1000 Ventilator*. (Report No. 2010-04). Fort Rucker, AL: U.S. Army Aeromedical Research Laboratory. (Defense Technical Information Center No. ADB355588).

**U.S. Army Aeromedical Research Laboratory — Fiscal Year 2010**

- Hall, B., Eshelman, R., Hayes, J., & Barazanji, K. (2009). *Joint Airworthiness Certification Evaluation of the Sorenson Medical, MARAA and Standard ambIT Infusion Pumps*. (Report No. 2010-05). Fort Rucker, AL: U.S. Army Aeromedical Research Laboratory. (Defense Technical Information Center No. ADB355590).
- Hall, B., Bowers, B., Eshelman, R., Hayes, J., Ramiccio, J., & Khalid Barazanji. (2009). Rotary-Wing Airworthiness Certification Evaluation of the Sequel Eclipse Model 1000A Oxygen Concentrator. (Report No. 2010-06). Fort Rucker, AL: U.S. Army Aeromedical Research Laboratory. (Defense Technical Information Center No. ADB355570).
- Hall, B., Bowers, B., Eshelman, R., Hayes, J., Ramiccio, J., & Khalid Barazanji. (2009). *Rotary-Wing Airworthiness Certification Evaluation of the Enginivty Enflow Model 100 Fluid Warmer*. (Report No. 2010-07). Fort Rucker, AL: U.S. Army Aeromedical Research Laboratory. (Defense Technical Information Center No. ADB355571).
- Hall, B., Bowers, B., Eshelman, R., & Hayes, J. (2009). *Airworthiness Test Results of the Belmont Buddy Lite Fluid Warmer*. (Report No. 2010-08). Fort Rucker, AL: U.S. Army Aeromedical Research Laboratory. (Defense Technical Information Center No. ADB355413).
- Rash, C., van de Pol, C., Harris, E., McGilberry, W., King, R., Braithwaite, M., Adams, M., & Hiatt, K. (2009). *The Effect of a Monocular Helmet-Mounted Display on Aircrew Health: A Cohort Study of Apache AH Mk 1 Pilots Four-Year Review*. (Report No. 2010-09). Fort Rucker, AL: U.S. Army Aeromedical Research Laboratory. (Defense Technical Information Center No. ADA511835).
- Brozoski, F., Logsdon, K., Vasquez, K., Lindsey, J., & Phelps, S. (2009). *Effects of Magnetic Receiver Unit (MRU) Installation on the Blunt Impact Protection of the HGU-56/P Aircrew Integrated Helmet System (AIHS)*. (Report No. 2010-10). Fort Rucker, AL: U.S. Army Aeromedical Research Laboratory. (Defense Technical Information Center No. ADA511431).
- Lawson, B. D., McGee, H., Castaneda, M. A., Golding, J. F., Kass, S. J., & McGrath, C. M. (2009). *Evaluation of several common antimotion sickness medications and recommendations concerning their potential usefulness during special operations*. (Report No. 09-15, ORA File No. 09-374). Pensacola, FL: Naval Aerospace Medical Research Laboratory.
- Webb, C. (2010). *Simulator Sickness in the MH-47G Simulator*. (Report No. 2010-11). Fort Rucker, AL: U.S. Army Aeromedical Research Laboratory. (Defense Technical Information Center No. ADA513134).

## U.S. Army Aeromedical Research Laboratory — Fiscal Year 2010

- Gaydos, S., Williams, R., Reeves, E., & Kelley, A. (2010). *Preliminary Characterization of the Noise-Immune Stethoscope (NIS) in High Ambient Noise Environment Using a Reverberation Sound Chamber*. (Report No. 2010-12). Fort Rucker, AL: U.S. Army Aeromedical Research Laboratory. (Defense Technical Information Center No. ADA514617).
- Hall, B., Bowers, B., Eshelman, R., Hayes, J., & Khalid Barazanji. (2010). *Rotary-Wing Airworthiness Certification Evaluation of the Vital Signs enFlow Warmer, Model 100 with the Vital Signs Power Supply, Model 120*. (Report No. 2010-13). Fort Rucker, AL: U.S. Army Aeromedical Research Laboratory. (Defense Technical Information Center No. ADB356934).
- Webb, C. & Hewett, K. (2010). *An Analysis of U. S. Army Fratricide Incidents during the Global War on Terror (11 September 2001 to 31 March 2008)*. (Report No. 2010-14). Fort Rucker, AL: U.S. Army Aeromedical Research Laboratory. (Defense Technical Information Center No. ADA517325).
- Webb, C., Gaydos, S., Estrada, A., & Milam, L. (2010). *Toward an Operational Definition of Workload: A Workload Assessment of Aviation Maneuvers*. (Report No. 2010-15). Fort Rucker, AL: U.S. Army Aeromedical Research Laboratory. (Defense Technical Information Center No. ADA528341).
- Kelley, A., Athy, J., Vasbinder, M., Chiaramonte, J., & Rath, E. (2010). *The Effect of Blast Exposure on Sleep and Daytime Sleepiness in U.S. Marine Corps Breachers*. (Report No. 2010-16). Fort Rucker, AL: U.S. Army Aeromedical Research Laboratory. (Defense Technical Information Center No. ADA528334).
- Gaydos, S., Kelley, A., Webb, C., Athy, J., Walters, P., Erickson, B., King, M., Lopez, D., Cruz, P., Wildzunas, R., & Estrada, A. (2010). *Comparison of the Effects of Ketamine and Morphine on the Performance of Representative Military Tasks*. (Report No. 2010-17). Fort Rucker, AL: U.S. Army Aeromedical Research Laboratory. (Defense Technical Information Center No. ADA528747).
- Hastings-Atkins, K. (2010). *Vibrotactile Postural Control in Patients that have Sit-to-Stand Balance Deficit and Fall*. (Report No. 2010-18). Fort Rucker, AL: U.S. Army Aeromedical Research Laboratory. (Defense Technical Information Center No. ADA528706).
- Athy, J., Klopfer, D., Moon, S., & Jurek, G. (2010). *The Effects of Visual Degradation on Attended Objects and the Ability to Process Unattended Objects within the Visual Array*. (Report No. 2010-19). Fort Rucker, AL: U.S. Army Aeromedical Research Laboratory. (Defense Technical Information Center No. ADA529361).

## U.S. Army Aeromedical Research Laboratory — Fiscal Year 2010

Hayes, J., Hall, B., Bowers, B., Eshelman, R., & Barazanji, K. (2010). *Rotary-Wing Airworthiness Certification Evaluation of the AutoMedx Simplified Automated Ventilator (SAVe) Model, 600x10*. (Report No. 2010-20). Fort Rucker, AL: U.S. Army Aeromedical Research Laboratory. (Defense Technical Information Center No. ADB362740).

### Technical Memoranda

Giffin, R. (5 October 2009). *M939 Five Ton Truck Accidents*. (Memorandum No. 2010-01). Fort Rucker, AL: U.S. Army Aeromedical Research Laboratory.

Webb, C. (6 November 2009). *Simulator Sickness in the MH-47G Simulator*. (Memorandum No. 2010-02). Fort Rucker, AL: U.S. Army Aeromedical Research Laboratory.

Barazanji, K. & Bowers, B. (2 December 2009). *Airworthiness Test Review for the Thornhill Modified Mobile Oxygen Ventilation and External Suction system (MOVES™)*. (Memorandum No. 2010-03). Fort Rucker, AL: U.S. Army Aeromedical Research Laboratory.

McLean, W. (29 December 2009). *JSAM Fixed Wing Conjugate Prism Measurements on the Gentex BOA Lens*. (Memorandum No. 2010-04). Fort Rucker, AL: U.S. Army Aeromedical Research Laboratory.

Walters, P. (19 November 2009). *ALSERP Case No 09-10, Class A Mishap, TH-67, Lucas Stage Field, 21 July 2009*. (Memorandum No. 2010-05). Fort Rucker, AL: U.S. Army Aeromedical Research Laboratory.

Walters, P. (12 November 2009). *ALSERP Case No 09-08, Class A Mishap, TH-1H, 40 mile NE of Fort Rucker, AL, 30 June 09*. (Memorandum No. 2010-06). Fort Rucker, AL: U.S. Army Aeromedical Research Laboratory.

Walter, P. (12 November 2009). *ALSERP Case No 09-09, Class B Mishap, OH-58D, Afghanistan, 19 July 2009*. (Memorandum No 2010-07). Fort Rucker, AL: U.S. Army Aeromedical Research Laboratory.

Walters, P. (9 November 2009). *ALSERP Case No 09-07, Class A Mishap, TH-67, High Bluff Stage Field, AL, 22 June 2009*. (Memorandum No. 2010-08). Fort Rucker, AL: U.S. Army Aeromedical Research Laboratory.

Walters, P. (8 December 2009). *ALSERP Case No 09-11, Class A Mishap, UH-60, 19 August 2009, Mount Massive, Colorado Mountains*. (Memorandum No. 2010-09). Fort Rucker, AL: U.S. Army Aeromedical Research Laboratory.

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- McLean, W. (28 January 2010). *ANVIS Quality Control Assessment for OMNI 6*. (Memorandum No. 2010-10). Fort Rucker, AL: U.S. Army Aeromedical Research Laboratory.
- Eshelman, R. (10 February 2010). *Test Results for the AutoMed<sub>x</sub> SAVe, model # 600x10 (S/N: 0833014) with AC/DC adapter*. (Memorandum No. 2010-11). Fort Rucker, AL: U.S. Army Aeromedical Research Laboratory.
- Walter, P. (28 December 2009). *ALSERP Case No. 09-12, Class A Mishap, UH- 60A, Joint Base Balad, Iraq, 19 September 2009*. (Memorandum No. 2010-12). Fort Rucker, AL: U.S. Army Aeromedical Research Laboratory.
- Williams, R. (8 February 2010). *Acoustical Analysis of the Aircraft Medical Oxygen Generation System (AMOGS)*. (Memorandum No. 2010-13). Fort Rucker, AL: U.S. Army Aeromedical Research Laboratory.
- Eshelman, R. (10 May 2010). *Test Results for the Mobile IV Systems LLC, Mobile IV System Assembly 20 Drops per Milliliter (dpml) Without Dial-Flow Regulator*. (Memorandum No. 2010-14). Fort Rucker, AL: U.S. Army Aeromedical Research Laboratory.
- McLean, W. (17 May 2010). *JSAM Rotary Wing Conjugate Prism Measurements on the SPH-4 Lens*. (Memorandum No. 2010-15). Fort Rucker, AL: U.S. Army Aeromedical Research Laboratory.
- McLean, W. (17 May 2010). *Optical Assessments of the Gentex Gradient Visor for the HGU-56/P*. (Memorandum No. 2010-16). Fort Rucker, AL: U.S. Army Aeromedical Research Laboratory.
- Reeves, E. (17 June 2010). *Noise Explosive Calculations of UH-60 Crew Wearing the CEPS*. (Memorandum No. 2010-17). Fort Rucker, AL: U.S. Army Aeromedical Research Laboratory.
- Walter, P. (29 June 2010). *ALSERP Case No 10-04 Class A Mishap UH60-L Iraq, 17 April 10*. (Memorandum No. 2010-18). Fort Rucker, AL: U.S. Army Aeromedical Research Laboratory.
- Walters, P. (24 June 2010). *ALSERP Case No 10-02 Class A Mishap OH-58D Speicher Airfield, Iraq, 8 Nov 2009*. (Memorandum No. 2010-19). Fort Rucker, AL: U.S. Army Aeromedical Research Laboratory.
- Walters, P. (24 June 2010). *ALSERP Case No 10-01 Class A Mishap MH-60L Little Creek, VA, Virginia Cape Operational Training Area, 22 Oct 2009*. (Memorandum No. 2010-20). Fort Rucker, AL: U.S. Army Aeromedical Research Laboratory.

## U.S. Army Aeromedical Research Laboratory — Fiscal Year 2010

Still, D. & McLean, W. (15 July 2010). *Optical Assessments of Refractive Power and Distribution for the Joint Service General Purpose Mask (JSGPM) and Outserts Update*. (Memorandum No. 2010-21). Fort Rucker, AL: U.S. Army Aeromedical Research Laboratory.

Bowers, B. (10 August 2010). *Airworthiness Test Results for the Thornhill MOVES™*. (Memorandum No. 2010-22). Fort Rucker, AL: U.S. Army Aeromedical Research Laboratory.

Walter, P. (11 August 2010). *ALSERP Case No 10-03 Class A Mishap AH-64 D McEntire Joint National Guard Base, SC 2 May 2010*. (Memorandum No. 2010-23). Fort Rucker, AL: U.S. Army Aeromedical Research Laboratory.

### Book Chapters

Dretsch, M. N. (2010). Enhancing operational readiness through neuroimaging: Mapping the Pathophysiology of mild traumatic brain injury in Warfighters. In Bartone, P. T., Pastel, R. H., and Vaitkus, M. A., (Eds.), *The 71F Advantage: Applying Army Research Psychology for Health and Performance Gains*. (pp. 261-282). Washington, DC: National Defense University Press.

Reinach, P. S., Zhang, F., Capó-Aponte, J. E. (2010). Ocular surface: Corneal epithelium: transport and permeability. Dartt, D.A., Besharse, J.C., & Dana, R., (Eds.), *Encyclopedia of the Eye, Volume 1*. (pp. 449-455). Oxford, UK: Elseviers Ltd.

### Presentations

Dr. Benton Lawson and Dr. Angus Rupert presented “Tactile feedback for balance rehabilitation” and provided a demonstration of the Tactile biofeedback rehabilitation device at the Association of the United States Army, Annual Meeting and Exposition in Washington, DC, 5-7 October 2009.

USAARL and NAVAIR researchers with collaborators presented a panel “The Biodynamics Data Resource: Human response to impulse accelerations” at the 47<sup>th</sup> Annual Safe Symposium in San Diego, CA, 19-21 October 2009. Personnel from USAARL also exhibited the capabilities of ALSERP, ALSE, and USAARL at the Symposium.

Chancey, V. C., Schmidt, A. L., Sumner, A. E., & Vasquez, K. B. “Establishment of the Biodynamics Data Resource.”

Francis, L., Nicolella, D., Schmidt, A. L., Sumner, A. E., Chancey, V. C., & Shender, B. S. “Modeling female response to impact acceleration.”



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Chancey, V. C., Schmidt, A. L., Sumner, A. E., Vasquez, K. B., & Shender, B. S. “The effect of head supported mass on human response to impact acceleration.”

LTC Kristen Casto presented “Hearing protection – USAARL perspective” at the Defense Advanced Research Projects Agency (DARPA) Bionic Ear-Enhancing Plug (BEEP) Workshop in Arlington, VA, 30 October 2009.

Dr. Amanda Kelley and Mr. Jeremy Athy presented “The effects of observation and intervention on the judgment of causal and correlational relationships” at the 30th Annual Meeting of the Society for Judgment and Decision Making in Boston, MA, November 2009.

Ms. Elmaree Gordon presented “Custom-molded hearing protection” at the DoD Auditory Working Group Meeting at Fort Rucker, AL, 4-5 November 2009.

Ms. Kim Vasquez, Ms. Katie Logsdon, and Dr. Carol Chancey presented “Characterization of Advanced Combat Helmet (ACH) force time traces from blunt impact events” at the Office of Vehicle Safety Research of the National Highway Traffic Safety Administration (NHTSA), 37th International Workshop on Human Subjects for Biomechanical Research. 2-9 November 2009.

CPT Michael Dretsch presented “Mild TBI symptoms mediate attentional impairment in Soldiers with PTSD” at the University of Illinois-Chicago Medical Center, Grand Rounds Neuroscience Seminar, in Chicago, IL, November 2009.

Dr. Carol Chancey and Dr. Debbie Reeves presented “Techniques in finite element modeling of helmeted-head biomechanics,” “High fidelity and compact modeling for bone conduction communication systems,” and “Computational modeling of helmet structural dynamics during blunt impacts” at the American Society of Mechanical Engineers International Mechanical Engineering Congress and Exposition (ASME IMECE) in Lake Buena Vista, FL. 13-19 November 2009.

Dr. Benton Lawson and Dr. Angus Rupert presented “Methods for assessment of balance functioning” at the James A. Haley Veteran’s Administration Hospital in Tampa, FL, 9 December 2009.

Dr. William Ahroon presented the paper “State of the art hearing protection – Operational” at the DARPA BEEP Workshop in Austin, TX, January 2010.

COL Joseph McKeon presented an overview of the USAARL, its involvement in the local community, the recent and ongoing research projects, and USAARL achievements that have directly led to equipment improvement used by Army personnel at the Enterprise Rotary Club, Enterprise, AL, 19 January 2010.

## **U.S. Army Aeromedical Research Laboratory — Fiscal Year 2010**

The abstract “ZAG-otolith: Modification of otolith-ocular reflexes, motion perception and manual control during variable radius centrifugation following space flight” authored by S. J. Wood, A. H. Clarke, Dr. Angus Rupert, D. L. Harm, and Gilles R. Clément was presented at the NASA Human Research Program Investigators’ Workshop in Houston, TX, 3-5 February 2010.

Dr. Angus Rupert presented demonstrations of the Tactile Situation Awareness System (TSAS) and the Tactile Balance Rehabilitation Device at the Pentagon in Washington, D.C., 5-14 February 2010.

CW5 Tom Morgan, ALSERP, and Mr. Dan Wise, JTAPIC Program, presented information on their respective programs for new team members on the JCAT and ASDAT on 10 February 2010 at Fort Rucker, AL.

USAARL researchers presented at the Integrated Research Team meeting on Acoustic Trauma Solutions for the Warfighter in San Diego, CA, 10-12 February 2010.

Reeves, E. R. & Ahroon, W. A. Developing ‘Ear armor.’

Hill, M. M., Casto, K. L., & Ahroon, W. A. Evaluation of a new treatment for tinnitus.

Casto, K. L. Quantifying hearing loss in the military.

USAARL researchers presented at the 35<sup>th</sup> Annual Hearing Conservation Conference of the National Hearing Conservation Association in Orlando, FL, 25-27 February 2010.

Ahroon, W. A. & Hill, M. M. Hearing loss among Soldiers exposed to impulses.

Casto, K. L. Influence of headset, hearing sensitivity, flight workload, and communication signal quality on flight performance and communications: An Army Black Hawk helicopter simulator experiment.

Dr. Arthur Estrada presented “A Comparison of the Efficacy of Modafinil and Dextroamphetamine as Alertness Promoting Agents in Aviators Performing Extended Operations” at the U.S. Army Aeromedical Consultant Advisory Panel (ACAP) at Fort Rucker, AL, March 2010.

COL Joseph McKeon presented “U.S. Army aviation medical standards and waiver policy” at the NATO HFM 196 Technical Course on “Fit for flying duties? NATO flight waiver policies” in Ramstein, Germany, 5-13 March 2010.

CPT Michael Dretsch presented a poster entitled “Mild TBI moderates executive attention in U.S. Army Soldiers with PTSD” at the International Brain Injury Association, 8<sup>th</sup> World Congress on Brain Injury in Washington, DC, 10-14 March 2010.

## **U.S. Army Aeromedical Research Laboratory — Fiscal Year 2010**

Ms. Catherine Webb presented “Simulator sickness in the MH47-G simulator” at the 160<sup>th</sup> Special Operations Aviation Regiment’s Safety Day at Fort Campbell, KY, 16-18 March 2010.

Mr. Robert Giffin presented an overview of the JTAPIC program at during the U.S. Army Combat Readiness / Safety Center’s Program of Instruction for the GSOC, Daleville, AL, 26 March 2010.

LTC Kristen Casto presented “Army audiology” to Doctor of Audiology (Au.D.) graduate students at Auburn University, Auburn, AL, 30 March 2010.

Ms. Catherine Webb presented “Fatigue and US Army Aviation: Current Regulations and Research” at the MITRE Workshop on Aviation Fatigue in Multi-Segment Operations, April 2010.

Dr. Thomas Harding, Mr. Ed Rash, and G. T. Lang presented “Perceptual and cognitive effects on the use of helmet-mounted displays due to external operational factors at the SPIE Defense and Security Symposium in Orlando, FL, April 2010

COL Joseph McKeon presented “Enhanced aviation and combat life support equipment: Medical technology for level 1 MEDEVAC teams” and Dr. Khalid Barazanji presented “Use of medical equipment in the military aeromedical environment: Challenges and design considerations” at the Military Medical Technology Summit in Washington DC, 1 April 2010.

Dr. Arthur Estrada presented “A Review of Team Performance Measures and Recent Experimental Challenges” at the Technical Cooperation Program (TTCP) Defence Human Systems Symposium in Sydney, Australia, May 2010. Co-authors on the presentation were Dr. Ben Lawson, Dr. Amanda Kelley, and Mr. Jeremy Athy.

Dr. William Ahroon presented “Medical brief: Hearing protection, communications and aural cuing” to the Air Soldier System Study for the Analysis of Alternatives at Fort Rucker, AL, May 2010.

USAARL researchers presented at the 81<sup>st</sup> Annual Scientific Meeting in Phoenix, AZ, 9-13 May 2010.

Athy, J. R., Gabauer-Hitzig, A., & Jones, H. Aerial command and control of unmanned aircraft systems.

Curry, I. P., Walters, L. & Lang, G. What we give them and what they actually use, An examination of aircrew life support equipment on operations with UK aircrew in Afghanistan.

## **U.S. Army Aeromedical Research Laboratory — Fiscal Year 2010**

Kelley, A. M., Webb, C., Athy, J., & King, M. The effect of sleep deprivation on the detection of correlational relationships and friend/foe detection judgments using a weapons simulator.

Shender, B. S., Paskoff, G. R., Chancey, C., Schmidt, A. L., Austermann, A. E., & Vasquez, K. B. Gender-based differences in kinematic response to the catapult phase of ejection.

Paskoff, G. R., Shender, B. S., Chancey, C., Schmidt, A. L., Austermann, A. E., & Vasquez, K. B. G-onset rate differences in kinematic response to dynamic +z-axis loading.

Still, D. L., Temme, L. A., & Acromite, M. T. (2010). Quantifying the effects of hypoxia and its countermeasures on the flight performance of military aviators in a simulator.

Temme, L. A., Still, D. L., Reeves, D., & Browning, R. The use of the Reduced Oxygen Breathing Device (ROBD) in a general civilian sample: Pulse oximetry means and ranges.

Webb, C. M., Estrada, A., Kelley, A. M., & Ramiccio, J. G. The effect of spatial disorientation on working memory and mathematical processing.

Wood, S. J., Clarke, A. H., Rupert, A. H., Harm, D. L., & Clement, G. R. Modification of otolith-ocular reflexes, motion perception and manual control during variable radius centrifugation following space flight.

LTC Kristen Casto presented “Neurosensory protection (acoustics injury)” and MAJ José Capó-Aponte presented “Eye injuries and visual dysfunctions induced by blast event” at the Ballistic/Blast Science and Technology Strategy Meeting, Frederick, MD, 12 May 2010.

Dr. Benton Lawson and Dr. Angus Rupert presented “Vestibular aspects of head injury and recently-initiated efforts to improve the testing and rehabilitation of vestibular function following head injury” at the Human Performance at Sea Conference in, Glasgow, U.K., 16-18 June 2010. Ms. Catherine Webb presented “An analysis of U.S. Army fratricide incidents during the Global War on Terror” at the 2010 Force Health Protection Conference, August 2010.

Dr. William Ahroon presented “Auditory, vestibular, and cognitive effects from repeated blast” to the USAMRMC MOMRP, Concussion Research in Progress Review, 4 August 2010.

LTC Kristen Casto presented “USAARL acoustics” to the Army Research Laboratory/AHP/Walter Reed Army Medical Center/USAARL Acoustics Working Group, Aberdeen Proving Grounds, MD, 24 August 2010.

ALSERP personnel presented at the ALSE Users Conference in Huntsville, AL, 24-26 August 2010. Attendance at the ALSE User Conference provided an opportunity to meet with PMs, equipment users, and representatives from industry.

## U.S. Army Aeromedical Research Laboratory — Fiscal Year 2010

Dr. William Ahroon presented an overview of “USAARL Acoustics – FY11” to the Naval Submarine Medical Research Laboratory in Groton, CT, 26 August 2010.

The OSAS, represented by Mr. Dan Wise and Ms. Marsha Fridle attended and presented USAARL-produced/JTAPIC-related briefings and posters at the Annual Infantry Warfighting Conference hosted by the U.S. Army Maneuver Center in Columbus, GA, 14-15 September 2010.

MAJ José Capó-Aponte and co-authors P. S. Reinach, H. Yang, and Z. Wang presented “Novel TRPV1-linked cell signaling pathways mediating inflammatory responses and wound healing in human corneal epithelial cells” at the Fourth Military Symposium Fourth Military Vision Symposium on Ocular and Brain Injury: Current Concepts in Detection, Treatment, and Restoration hosted by the Schepens Eye Research Institute, Boston, MA, 26-29 September 2010.

LTC Kristen Casto and co-author Dr. John Casali presented “Effect of communications headset, hearing ability, flight workload, and communications signal quality on pilot performance in an Army Black Hawk simulator” at the Human Factors and Ergonomics Society’s 54<sup>th</sup> Annual Meeting, San Francisco, CA, 30 September 2010.

### Grant Proposals

Ahroon, W. A. (Principal Investigator). *Auditory, Vestibular, and Cognitive Effects from Repeated Blast*. FY08 USAMRMC Intramural War Supplemental Program. \$1,848,383 (USAARL, funded).

Ahroon, W. A. (Principal Investigator). *Return to Duty Assessment Following Head Trauma (TBI) Using Whole Body Rotational Testing*. FY10 Intramural Defense Medical Research and Development Program. (USAARL, not funded).

Baker, M. (Principal Investigator), & Dretsch, M. (Consultant). *Project BLAST: The Balad Longitudinal Assessment of the Symptoms of TBI/PTSD*. FY09 Defense Medical Research and Development Program. (San Antonio Medical Center, not funded).

Barazanji, K. (Principal Investigator). *Development of Traumatic Brain and Spinal Injury Transport Litter Kit*. FY10 Intramural Defense Medical Research and Development Program. (USAARL, not funded).

Brill, C. (Principal Investigator), & Lawson, B. D. (Collaborator). *Neurocognitive Assessment of International Space Station (ISS) Astronauts: Space Adaptation Syndrome (SAS) and Post-adaptation Effects*. National Aeronautics and Space Administration (NASA) Research Announcement (NRA). \$67,000 (Old Dominion University, pending).

**U.S. Army Aeromedical Research Laboratory — Fiscal Year 2010**

- Brozoski, F. (Principal Investigator), & Duma, S. (Co-Investigator). *Facial Fracture Injury Risk Functions for Assessing the Performance of Improved Face and Eye Protective Equipment*. FY08 USAMRMC Intramural War Supplemental Program. \$448,375 (USAARL, funded).
- Capo-Aponte, J. (Principal Investigator), & Reinach, P. (Co-Investigator). *Determination of Novel Strategies for Hastening Corneal Wound Healing and Reducing Tissue Inflammation*. FY08 USAMRMC Intramural War Supplemental Program. \$360,453 (USAARL, funded).
- Chancey, V. C. (Principal Investigator) *Integrated Experimental and Computational Framework for the Development and Validation of Blast Wave Brain Biomechanics and Helmet Protection*. FY10 Intramural Defense Medical Research and Development Program. \$1,500,000 (USAARL, funded).
- Chapman, P. (Principal Investigator), & Dretsch, M. (Associate Investigator). *Creating Proteomic Profiles and Assessing Cognitive Functioning in OEF/OIF Veterans with PTSD and those with comorbid mTBI*. Veterans Affairs Grant, Health Services Research and Development, Merit Review Award, Pilot Project Program. (Tampa Veterans Affairs Hospital, not funded).
- Cripton, P. (Principal Investigator), & Barazanji, K. (Co-Investigator). *Vibration and Shock Exposure Limits for Transport of the Acute Spinal Cord Injured*. FY10 Extramural Defense Medical Research and Development Program. \$2,348,595 (University of British Columbia, funded).
- Dretsch, M. (Principal Investigator). *Alternative Behavioral and Electrophysiological Treatments of Cognitive Rehabilitation for Chronic Combat-Related Mild Traumatic Brain Injury*. FY11 Psychological Health and Traumatic Brain Injury Research Program. \$199,331,000 (USAARL, pending).
- Estrada, A. (Co-Principal Investigator). *Sensorimotor Displays and Controls to Enhance Lunar Landing*. National Space Biomedical Research Institute. \$99,650 (Massachusetts Institute of Technology, funded).
- Gaydos, S. (Principal Investigator) *Assessment of Noise Immune Stethoscope in Noisy Clinical and Military Applications*. FY10 Intramural Defense Medical Research and Development Program. \$397,000 (USAARL, funded).
- Hill, M. (Principal Investigator). *Auditory, Vestibular and Cognitive Effects due to Repeated Blast Exposure on the Warfighter*. FY07 Intramural TBI Investigator Initiated Research Award. \$1,207,026 (USAARL, funded).

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- Haub, M. (Principal Investigator), & Dretsch, M. (Associate Investigator). *Omega-3 Fatty Acids and Cognitive Outcomes in Soldiers Deployed to Combat Areas*. FY09 Psychological Health and Traumatic Brain Injury Research Program. (Kansas State University, not funded).
- Kelley, A. (Principal Investigator). *The Efficacy of Combined Pharmacologic and Non-pharmacologic Interventions for Fatigue Management*. FY10 Intramural Defense Medical Research and Development Program. (USAARL, not funded).
- Kelley, A. (Principal Investigator). *The Effect of Combat Deployment and Traumatic Brain Injury on Risky Driving Behaviors*. FY10 Intramural Defense Medical Research and Development Program. (USAARL, not funded).
- Kent, R. (Principal Investigator), & Chancey, V. C. (Co-Investigator). *Occupant Kinematics and Injury Mechanisms during Underbody Blast Loading*. FY10 Extramural Defense Medical Research and Development Program. (University of Virginia, not funded).
- Knight, D. (Principal Investigator), & Dretsch, M. (Associate Investigator). *Neuroimaging Biomarkers and Virtual Reality Differentiation of Mild TBI and PTSD*. FY09 Psychological Health and Traumatic Brain Injury Research Program. (University of Alabama at Birmingham, not funded).
- Knight, D. (Principal Investigator), & Dretsch, M. (Co-Principal Investigator). *Biomarkers of Post-Traumatic Stress Disorder and SSRI Treatment Efficacy*. FY09 Defense Medical Research and Development Program. (University of Alabama at Birmingham, not funded).
- Knight, D. (Principal Investigator), & Dretsch, M. (Co-Principal Investigator). *Biomarkers of Post-Traumatic Stress Disorder and SSRI Treatment Efficacy*. National Institutes of Health, RO1 Research Project Grant. (University of Alabama at Birmingham, not funded).
- Lawson, B. D. (Co-Principal Investigator), & Rupert, A. H. (Co-Principal Investigator). *Home-Based System to Improve Balance Rehabilitation for mTBI Sufferers and Other Personnel with Balance Problems*. Telemedicine and Advanced Technology Research Center (TATRC) AMEDD Advanced Medical Technology Initiative (AAMTI). \$1,220,000 (pending).
- Little, D. (Principal Investigator), & Dretsch, M. (Associate Investigator). *Identification and Validation of Central Mechanisms (Biomarkers) of Sustained Impairment in Chronic TBI*. FY09 Psychological Health and Traumatic Brain Injury Research Program. (University of Illinois-Chicago, not funded).
- Little, D. (Principal Investigator), & Dretsch, M. (Consultant). *Sensitivity and Specificity of Oculomotor Function for TBI Diagnosis*. FY09 Psychological Health and Traumatic Brain Injury Research Program. (University of Illinois-Chicago, not funded).

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- Little, D. (Principal Investigator), & Dretsch, M. (Associate Investigator). *Remote Monitoring and Characterization of Cognitive Status by Telephone in Mild TBI*. FY09 Psychological Health and Traumatic Brain Injury Research Program. (University of Illinois-Chicago, not funded).
- Little, D. (Principal Investigator), Dretsch, M. (Associate Investigator). *Validation of Brain Stem Nuclei FA Values as Biomarkers of mTBI*. FY09 Spinal Cord Injury Research Program, Investigator-Initiated Research Award. (University of Illinois-Chicago & Chicago Veterans Affairs Hospital, not funded).
- Little, D. (Principal Investigator), & Dretsch, M. (Associate Investigator). *Effects of Injury Mechanism on Cerebral White Matter Burden in Mild TBI*. Veterans Affairs Grant. (University of Illinois-Chicago & Chicago Veterans Affairs Hospital, not funded).
- McEntire, B. J. (Principal Investigator), Bass, C. (Co-Investigator), & Walilko, T. (Co-Investigator). *Helmet Sensor - Transfer Function and Model Development*. FY07 Intramural TBI Investigator Initiated Research Award. \$625,230 (USAARL, funded).
- Parra, L. (Principal Investigator), & Casto, K. (Investigator). *Tinnitus as a Result of Central Gain Adaption: Implication to Diagnosis and Treatment with Auditory Stimulation*. FY10 Peer Reviewed Medical Research Program. \$329,960 (City College of the City University of New York, pending).
- Peak, M. (Principal Investigator), Lawson, B. D. (Associate Investigator), & Rupert, A. H. (Associate Investigator). *Functional Rehabilitation of Dynamic Balance Capability*. FY10 Extramural Defense Medical Research and Development Program. (Veterans Affairs Biloxi Clinic, not funded).
- Rupert, A. H. (Principal Investigator). *Post-concussion Tools to Assist with Assessment, Treatment, and Return to Duty*. FY08 USAMRMC Intramural War Supplemental Program. \$817,970 (USAARL, funded).
- Rupert, A. H. (Co-Principal Investigator), Goto, M. (Co-Principal Investigator), & Lawson, B. D. (Associate Investigator). *Joint VA/DoD Traumatic Brain Injury Balance Care Capability*. DoD and Department of Veterans Affairs Joint Incentive Fund. (USAARL, not funded).
- Rupert, A. H. (Principal Investigator), & Lawson, B. D. (Associate Investigator). *Prototyping a Tactile Feedback Device to Enhance Balance Rehabilitation*. FY10 Intramural Defense Medical Research and Development Program. (USAARL, not funded).



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- Rupert, A. H. (Principal Investigator), & Lawson, B. D. (Associate Investigator). *Touch/Tactile Feedback for Rehabilitation of Wounded Warriors*. Coalition Warfare Program. \$200,000 (USAARL, funded).
- Rupert, A. H. (Principal Investigator), & Lawson, B. D. (Associate Investigator). *Returning Head-Injured Warriors to Duty*. Coalition Warfare Program. (USAARL, not funded).
- Sabel, B. (Principal Investigator), & Temme, L. (Co-Investigator). *Restoration of Vision after Brain Injury using Non-invasive Electrical Stimulation*. FY10 Extramural Defense Medical Research and Development Program. (University of Magdeberg, Germany, not funded).
- Salzar, R. (Principal Investigator), & Chancey, V. C. (Co-Investigator). *Investigation of Injuries to Armored Vehicle Personnel Subject to Blast: Preliminary Study with Emphasis on Lower Extremity Fractures*. FY10 Extramural Defense Medical Research and Development Program. \$2,781,000 (University of Virginia, funded).
- Snyder, B. (Principal Investigator), & Chancey, V. C. (Co-Investigator). *Stereographic Ultrasound Imaging of the Cervical Spine*. National Institutes of Health, R21 Research Project Grant. (Harvard Medical School, pending).
- Snyder, B. (Principal Investigator), & Chancey, V. C. (Co-Investigator). *Cervical Spine Ultrasound Imaging*. FY10 Extramural Defense Medical Research and Development Program, Peer Reviewed Orthopaedic Research Program. (Harvard Medical School, not funded).
- Temme, L. A. (Principal Investigator), Still, D. (Co-Investigator), & Reeves, D. (Co-Investigator). *The Effects Hypoxia on Cognitive Function in Aviators and Complex System Operators that have had an mTBI*. FY07 DoD TBI Investigator Initiated Research Award. \$598,198 (USAARL, funded).
- Wilder, D. (Principal Investigator), & Barazanji, K. (Co-Investigator). *Vibration of Prone and Supine Litter-Bound Subjects*. FY10 Extramural Defense Medical Research and Development Program, Peer Reviewed Orthopaedic Research Program. (University of Iowa, not funded).
- Winkelstein, B. (Principal Investigator), & Chancey, V. C. (Co-Investigator). *Development of a Novel Translational Model of Vibration Injury to the Spine to Study Acute Injury in Vivo*. FY10 Extramural Defense Medical Research and Development Program. (University of Pennsylvania, not funded).
- Wise, D. (Principal Investigator). *Helmet-mounted Sensor Recorded Blast Data in Combat*. FY07 Intramural TBI Advanced Technology/Therapeutic Development Research Award. \$1,357,629 (USAARL, funded).

## **U.S. Army Aeromedical Research Laboratory — Fiscal Year 2010**

### **Research Seminars**

In January 2003, the USAARL began a series of research seminars. The purpose of these seminars is to promote communication and discussion about scientific interests, achievements, research methods and general principles among our laboratory staff members. Seminar presentations are offered by members of the USAARL research staff and, through invitation, by qualified visitors. Announcements of seminar presentations are sent to the entire USAARL staff, several divisions of the U.S. Army Aeromedical Center (Lyster Army Health Clinic), and the USACRC/SC.

The following seminars were offered during FY10:

Date: 15 December 2009

Place: USAARL Lecture Room

Speakers: Mr. Robert Charles and Mr. Barry Datlof (U.S. Army Medical Research and Materiel Command)

Title: What if you Screamed “Eureka” and Nobody Heard?

Abstract: An overview of technology transfer to include invention disclosures, patents, trademarks, copyrights, and commercialization was presented. Other topics covered include collaboration with outside partners (e.g., cooperative research and development agreements, material transfer agreements, patent license agreements, educational partnerships, contracts, grants and cooperative agreements) and nondisclosure agreements.

Date: 9-10 February 2010

Place: USAARL Lecture Room

Speakers: Mr. Charles Needham (Applied Research Associates)

Title: Blast Physics and Blast Physics Software

Abstract: The presentations focused on blast physics to include governing equations and explanation of physics-based software.

Date: 11 March 2010

Place: USAARL Lecture Room

Speakers: CPT Christopher Long (Georgetown University)

Title: Leadership and Authority

Abstract: CPT Long presented his current research on leadership and authority. He provided an overview of key aspects of leader authority and examined how and why leaders integrate three central elements of their authority: efforts to promote control, trust, and fairness. He demonstrated how leaders’ efforts to exercise authority through combinations of these activities influence subordinates’ perceptions of their leaders and their work environments. He concluded with a discussion about how his research is relevant to military organizations and psychological factors affecting military personnel.

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Date: 28 April 2010

Place: USAARL Lecture Room

Speakers: Dr. Keith Bartels (Southwest Research Institute)

Title: Biomedical Engineering at Southwest Research Institute

Abstract: An overview of the Southwest Research Institute's Biomedical Engineering Section's expertise, research focus areas, and projects completed was provided. The Biomedical Engineering Section operates under an ISO-13485 quality system and provides research and development and testing services for the medical device industry and the government. The presentation focused on work the Southwest Research Institute has conducted in the area of active removal of motion artifact from physiological sensors.

Date: 3 May 2010

Place: USAARL Lecture Room

Speakers: Dr. Daniel Cohen (London Metropolitan University) and Dr. Martin Haines

Titles: Neuromuscular Screening, Benchmarking, and Return-to-Duty Markers

Simple Biomechanical Screening and Solutions

Abstract: not provided

## **U.S. Army Aeromedical Research Laboratory — Fiscal Year 2010**

### Research Support

#### Flight Activities

During FY10, the Flight Systems Branch (FSB) personnel comprised one Department of the Army Civilian Supervisory Research Helicopter Instructor Pilot, one Army Reserve (Individual Mobilized Augmentee [IMA]) Army Medical Department (AMEDD-67J O-4) Officer, and two active-duty (AMEDD-67J O-3) officers (Flight Operations Officer and Safety Officer).

Since 1959, USAARL has served the aviation community by providing world-class aeromedical research aboard our unique aircraft. USAARL's prestigious identity and the ability to conduct this critical aeromedical mission depend in part on the unique capabilities we possess with respect to our aviation assets.

Assigned assets in FY10 were:

JUH-60A: 88-26069 Black Hawk helicopter

NUH-60FS: 85-00009 UH-60 Aeromedical/environmental research flight simulator

Flight hours in the USAARL aircraft/simulator in FY10 were:

Rotary-wing flight, JUH-60A = 300.9 hours

HH-60M = 77.5 hours

HH-60L = 16.4 hours

UH-60L = 11.5 hours

Simulator flight utilization = 449.8 hours

Simulator peripherals utilization = 980 hours

Note: Simulator peripheral use included VIP tours; research support set-up process; test runs; software load demonstrations; fit, form, and equipment function checks; test preparation; protocol rehearsal and train-up; static cockpit demonstrations; device capabilities presentations; and simulator reaccreditation.

### Summary of FSB Research Support

The FSB concluded a productive research support year completing several capstone projects. The effective use of our research assets and aviators provided support to all of the internal research divisions and an ever-growing number of external organizations.

## **U.S. Army Aeromedical Research Laboratory — Fiscal Year 2010**

### *Tactile Situational Awareness System*

USAARL gained Airworthiness Release (AWR) Certification and Defense Safety Oversight Council (DSOC) funding (\$420K) to begin demonstration flights with the TSAS which will continue through FY11. TSAS is a tool designed to prevent accidents related to brownout/degraded visual environments (DVE). TSAS enhances situational awareness, reduces pilot workload, prevents spatial disorientation, and is an excellent DVE landing tool. Research 069 will be the workhorse for an international program (Canada, Australia, and U.S.), to demonstrate this workload-reducing, situational-awareness-enhancing tool.

### *Stroboscopic Motion Sickness Prevention Study*

This protocol produced 15.4 research flight hours aboard Research 069. Subjects were exposed to a strobe light while conducting maneuvering flight. The strobe light is thought to eliminate a retinal-slip, thus reducing motion sickness symptoms.

### *Army Aircraft Noise Level Measurement Study*

This ongoing study measures actual noise levels aboard maneuvering helicopters. Aircraft platforms measured in FY10 included the JUH-60A, MH-60K, CH-47, and HH-60M.

### Airworthiness Certification of Patient Movement Items Program

Over the past 10 years, Aviation and Missile Research Development and Engineering Center (AMRDEC)/USAARL have approved and standardized electromagnetic interference (EMI)/electromagnetic compatibility (EMC) test procedures at the Joint Preflight Integration of Munitions and Electronic Systems (J-PRIMES) facility at Eglin Air Force Base. These test procedures are unique to the testing of medical devices for the MEDEVAC H-60 fleet. The ACE Branch is the leading DoD component for certifying PMIs for flight. In FY10, testing comprised laboratory bench testing, environmental testing, vibration testing, EMI/EMC analysis, human factors assessments by flight surgeons and flight medics, and was validated by a comprehensive in-flight evaluation aboard USAARL's JUH-60A. USAARL not only conducted in-flight data collection with this aircraft but also served as the single point laboratory leading DoD for certification of PMI. Army Regulation (AR) 40-61, Medical Logistics for Patient Medical Items, designated USAARL as the test laboratory for this robust and rapidly expanding program. The platform-specific service (JUH-60A) afforded AWR coverage for the entire MEDEVAC fleet and produced AWR1330R, authorizing the use of PMI aboard these aircraft. This was a critical mission for our MEDEVAC fleet of helicopters, for the AMEDD community, and for USAARL.

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FY10 ACE- PMI Program highlights included:

- a. J-PRIMES electromagnetic chamber testing, Eglin Air Force Base aboard HH-60M Advanced MEDEVAC helicopter for medical item certification.
- b. J-PRIMES EMC evaluations aboard JUH-60A Research 069 for medical item certification.
- c. Advanced Medical Oxygen Generating Systems (AMOGS) performance testing aboard HH-60M Advanced MEDEVAC helicopter.
- d. User evaluation testing in USAARL's JUH-60A in collaboration with the AMEDD Test Board, Air Force Medical Evaluation Support Activity (AFMESA), U.S. Special Operations Command (SOCOM), and USMC.

### PMI Tests Flown in Support of the ACE Branch

<b>JUH-60A</b>	<b>HH-60M</b>
SeQual Omni II/SAROS Portable Oxygen Concentrator	OxLife Independence Oxygen Concentrator
RDT Tempus Physiological Monitor	SeQual Omni II/SAROS Portable Oxygen Concentrator
Cardiac Science Power heart G3 Pro AED	Impact 754 Vent with AMOGS
Physio-Control Lifepak 1000 AED	Cardiac Science Power heart G3 Pro AED
Mobile IV System	Phillips FR3 Heart Start AED
Belmont Buddy Lite Fluid Warmer	Physio-Control Lifepak 1000 AED
Impact 731 Ventilator	Physio-Control Lifepak 15 Physiological Monitor
	Physio-Control Lifepak 15 Battery Support System
	Impact Instrumentation 731 Ventilator
	Nonin Medical, 9550 Onyx pulse oximeter

### Special Aircraft Configuration/Equipment

- a. Sikorsky Airborne Information System (AIS) and human physiological telemetry devices serve as the data collection and transmission systems that provide for empirical data gathering. This is a dedicated data collection system unique only to this aircraft.
- b. A Garmin 530W global positioning system (GPS) was installed as part of a DSOC initiative, which assessed commercial off-the-shelf (COT) solutions for enhancing pilot situational awareness and preventing controlled flight into terrain (CFIT) accidents. This GPS system has a moving map display, Helicopter Terrain Avoidance Warning System (HTAWS), Traffic Collision Warning System (TCAS), Wide Area Augmentation System (WAAS) enabled GPS precision approach capability, storm scope, and NEXRAD weather radar.
- c. 200 Gal Internal Robertson fuel tank and a 12-point VIP II ICS System, allows extended range/endurance research protocols and supports U.S. Army Aviation Center of Excellence (USAACE)'s cross-country VIP mission.

## **U.S. Army Aeromedical Research Laboratory — Fiscal Year 2010**

- d. Distance Measuring Equipment provides definitive navigation during risky protocols.
- e. Wx1000+ Storm scope, ASN 128D GPS, and Bendix King Color Wx Radar provide an all-weather solution that reduces risk and increases capabilities. These attributes serve both the research and VIP requirements.
- f. Medical evacuation carousel, provisions for internal and external hoists, Aircrew Wireless Intercom System (AWIS) serve as the MEDEVAC representation needed to properly assess medical items and systems.
- g. Lima model Improved Durability Gear Box main transmission, Blue Force Tracker electronic data manager (EDM) kneeboard and Fiber Optic Gyro systems are also part of the special aircraft equipment.

### Regulatory Guidance for Aircraft Utilization

- a. U.S. Army Medical Command (MEDCOM) and USAMRMC research objectives and congressional priorities
- b. AR 95-1 8-1c *The Surgeon General will coordinate health hazard assessment for research, development, testing, and evaluation of medical materiel and related items; medical design criteria; and other medical aspects of nonmedical ALSE items.*
- c. AR 40-61 Airworthiness Certification of PMIs Medical Services Medical Logistics Policies

### Flight Systems Branch Accomplishments

- a. Our greatest accomplishment was that FSB pilots have continued our phenomenal accident and incident free safety and performance record. To date, USAARL has never had a Class A, B, or C aviation accident.
- b. Our pilots maintained qualifications in all models of the Black Hawk (JUH-60A, HH-60L, HH-60M) and currency in all modes of flight (i.e., day, night, weather, and night vision goggle).

The JUH-60 and HH-60M Black Hawks were used in the following research support and external protocol and VIP support missions:

- a. Flew multiple local dignitary and VIP support missions in accordance with the USAARL and USAACE memorandum of agreement (MOA).
- b. Provided HH-60M static display support to the Aeromedical Evacuation Conference, Panama City, FL.
- c. Provided HH-60M static display and aeromedical presentation to the Aeromedical Transport Conference, Fort Lauderdale, FL.
- d. Flew initial noise survey flights in support of noise measurement study of all U.S. Army helicopters, a collaborative effort with Task Force (TF)-160 Special Operations Aviation Regiment (SOAR).
- e. Assess in-flight EMI and human factors of dozens of PMI in support of USAARL's ACE Branch (AR 40-61) and in collaboration with APM MEDEVAC PM Utility Helicopters.

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The NUH-60FS full-motion aeromedical/environmental Black Hawk flight simulator was used in numerous research projects:

- a. Over 62 aeromedical research hours were dedicated to investigating sub-threshold cueing of pilots under a variety of workload conditions. The aim of this study was to help future aviators better manage cockpit workload during high stress events.
- b. The simulator was used for A NASA/MIT/USAARL collaboration investigating lunar lander brownout reduction methods using visual displays. The aim is to mitigate the risk of encountering a DVE (brownout) in future moon landing missions.
- c. NAVAIR investigators used the research simulator to investigate pilot comfort and fatigue experienced while wearing the latest generation life support equipment aircrew vest. The study utilized the multi-mission configuration approach (ship-to-shore, MEDEVAC, changing environmental conditions) to simulate low-to-high pilot workload over long missions (i.e., 4 to 8 hours in duration).
- d. Assessments were made in the research simulator for the ARB to determine the noise volume attainable to replicate the actual UH-60 aircraft noise pattern while investigating noise attenuating hearing protection devices.
- e. The TSAS demonstrations (78 hours) were conducted in the simulator. Using TSAS while flying in realistic DVEs proved to be beneficial in the proof of concept of TSAS as an effective DVE landing tool, as well as a workload reducing and situation awareness enhancing device. The NUH-60FS device is the safest and most cost-effective system for demonstrating this evolving technology.
- f. Multiple research tours were conducted for researchers and their colleagues to demonstrate the capability of the world's only environmentally-controlled, full-motion simulator. Tours were given for representatives of organizations such as the Program Executive Office for Simulation, Training, and Instrumentation (PEO STRI), USAACE headquarters, Concepts and Requirements Directorate (CRD). Foreign dignitaries and faculty and staff from multiple colleges and universities participated in several tours.
- g. USAACE, Department of Simulations (DoS), Director of Evaluation and Standardization (DES), Army Training Modernization Directorate (ATMD)/G-3, E Company 1-212<sup>th</sup> Flight School XXI, the Foreign Officer Liaison offices, MEDEVAC Proponency, as well as the students of the U.S. Army Flight Surgeons course and ASOC used the research simulator for training on a no-cost basis accounting for nearly one-third of the total utilization.
- h. USAARL flight crews maintained aircraft and instrument proficiency using the simulator. External Annual Proficiency Evaluations (APART) and training were conducted for Fort Rucker agencies in accordance with the USAACE/Aviation Center Logistics Command (ACLC)/USAARL MOA. USAARL continued its support to the 110<sup>th</sup> Aviation Brigade providing back-up simulator in support of Flight School XXI during times when USAACE simulators experienced maintenance difficulties.
- i. Mr. John Ramiccio, panel member for the Aeromedical Consultation Panel and Aeromedical Research Pilot, used the flight simulator to conduct aeromedical flight assessments for aviators in the process of obtaining aeromedical waivers for continuing aviation service.



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- j. Enhanced Brownout Dust Model Software was developed in collaboration with PEO STRI and the DoS. Installation and test development occurred that produced the world's first enhanced-brownout model simulation. This highly realistic dust model produces a variety of dust cloud characteristics, to include the dust characteristics found on the moon.

### Maintenance of the JUH-60A Research Helicopter

The MOA with USAACE/ACLC/G-3 continues and has proven to be beneficial to all organizations involved.

### Maintenance Management of the NUH-60 Research Simulator

The NUH-60FS simulator received major upgrades to both hardware and software systems. The device received new XIG image generators and six new Christi digital displays. Coupled with the enhanced dust-model, the aeromedical device remains the premier UH-60 flight simulator of the fleet. The aeromedical device underwent close scrutiny of its systems, displays control and handling qualities, software control, and maintenance support, passing bi-annual reaccreditation in impressive fashion this calendar year.

### Standardization/Aircrew Training Program

- a. All USAARL pilots and aircrew successfully passed the U.S. Army Forces Command (FORSCOM) ARMS inspection in July 2010. 100% of the Aircrew Training Program (ATP) received flight and/or written evaluations.
- b. Additional Instructor Pilot ratings, Commercial Flight Instructor (CFI) and Commercial Flight Instructor-Instruments (CFII) rating were successfully obtained by CPT Mike Crivello.
- c. Mr. John Ramiccio, MEDCOM/USAARL Standards Officer conducted an annual instrument evaluation for Defense Contract Management Agency (DCMA) Sikorsky plant pilot. Mr. Ramiccio continued his additional duties as the MEDCOM Standardization Officer. This assignment placed Mr. Ramiccio in the position to provide MEDEVAC and Army Aviation Standardization consultation directly to the Office of the Surgeon General (OTSG). Mr. Ramiccio completed the HH-60M Instructor Pilot qualification and subsequent Standardization Instructor Pilot progression. These qualifications were obtained at no cost to USAARL and concurrent with the ACE Branch support mission.
- d. All research pilots participated in the annual Aircrew Coordination Training (Enhanced) and scored 100% on all written and performance evaluations. The FSB team provided Aircrew Management training and records support for several Army flight surgeons, active duty support pilots, Flight Activity Categories (FAC) three aviators, and Army civilians.
- e. CPT Chris Wingate and CPT Nick Spangler completed Readiness Level Progression and were advanced to Pilot-in-Command status.
- f. All FSB personnel completed Acquisition (ACQ) 101 training certification. CPT Spangler completed ACQ 201A training certification.

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- g. The FSB team members were active members of the USAARL Safety and Standardization Council during FY10.

### External Organization Subject Matter Expertise Support

FSB civilian research instructor pilot serves a variety of external organizations as an aviation and aeromedical SME/consultant:

- a. Army Night-Vision Labs - Advanced Distributed Aperture System (ADAS)/OPUL.
- b. NASA/MIT Brownout Prevention for Lunar Lander Project.
- c. UAS-Board of Directors Stake Holder panel.
- d. A-PM MEDEVAC HH-60M model AMOGS and AWR certifications.
- e. Clearwater Army Reserves providing pilot training and qualifications aboard the HH-60L.

Conducted annual APART instrument evaluation for a DCMA pilot assigned to Sikorsky Aircraft in Stratford, CT. As MEDCOM Standardization Officer, he provided consultation regarding the FAA helipad certification requirements to MEDCOM headquarters. USAARL research pilots continue to serve as members of the Office of the Secretary Defense (OSD), DSOC and have contributed to reducing CFIT accidents, improving seat and seat restraints systems, and brownout/degraded visual environment solutions.

### Flight Systems Branch AMEDD Pilots External Support

- a. Provided Aviation Center Logistics Command assistance in ferrying multiple UH-60A/M aircraft to and from maintenance facilities in Savannah, GA, Huntsville, AL, and Fort Campbell, KY.
- b. Provided pilot protocol, training, and ferry missions support in accordance with the USAACE, ACLC, and USAARL MOA
- c. Attended several U.S. Army Aviation and Missile Command (AMCOM) Airworthiness Certification Coordination teleconferences.
- d. Served as member of the AMEDD Evacuation Integrated Concept Team (ICT).
- e. Supported USAMRMC by providing TSAS demonstrations at the Association of Army Aviation (Quad A) and the Army Science Conferences.
- f. Provided training support and standardization consultation to MEDEVAC proponentcy.

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### Technology Transfer

USAARL maintained an active technology transfer program in FY10 through distribution of its technical reports, publication in the open literature, presentations to military and civilian audiences, execution of Cooperative Research and Development Agreements (CRADAs) and Material Transfer Agreements (MTAs), and protection of intellectual property through invention disclosures and patenting.

USAARL is a member of the Federal Laboratory Consortium as well as an active community member and participant in technology transfer activities within the state of Alabama. Examples of USAARL's contributions to the locality include the loan of excess research equipment to regional universities under MTAs and donation of excess computers under Education Partnership Agreements (EPAs) to two local schools (Hillcrest Elementary School and Opp City School).

USAARL utilized the Oak Ridge Institute for Science and Education (ORISE) Internship Program, an EPA program, to place eleven interns in research projects.

Two patents were granted for USAARL inventions. U.S. Patent 7,779,359 issued on 17 August 2010 for the "Multifunction Display Design Tool." U.S. Patent 7,734,101 issued on 8 June 2010 for the "Apparatus and System for Testing an Image Produced by a Helmet-Mounted Display." Two new invention disclosures were filed.

Researchers addressed local civic organizations and conducted numerous USAARL tours. These tours began with a Laboratory overview followed by in-depth discussions of the research programs.

In FY10, one of USAARL's strategic goals was to influence Army combat and materiel developers. The objective was to promote USAARL's capability to positively impact and improve the products made by these developers. In order to achieve this, USAARL employed the strategy of teaming, through CRADAs, with materiel developers. USAARL partnered with industry to evaluate and enhance medical equipment for use on MEDEVAC aircraft, to collaborate on visual performance issues, and to investigate the effect of helmet configuration on the injury incidence rate. The exchange of technical information and testing of materiel furthered the development of improved life support and personnel protective devices, systems and components for military medical purposes. ACE CRADAs were funded by collaborators in FY10 for a total of \$111,455.00.

USAARL CRADA/MTA partners in FY10 were:

*BAE Systems* for collaboration on basic and applied research into optical, visual, acoustical, auditory, and biodynamic issues with head-borne systems.

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*Bio-Behavior Analysis Systems* to exchange data and technical expertise in the study of maintenance of alertness.

*CareFusion* (formerly Viasys Healthcare/Pulmonetic Systems) for collaborative research, development, test, and evaluation on medical devices for use on medical and casualty evacuation aircraft.

*EyeCom Corporation/Washoe Sleep Disorders Center* for cooperative testing and evaluation of an SBIR-developed eye tracking system capable of integrating into a physiologic monitoring system to assess for and predict potential operational performance failures.

*Florida Institute for Human and Machine Cognition* for exchange of data and technical expertise in a study of the use of human-centered novel display technologies in aviation.

*Gaumard Scientific Co., Inc.* for collaborative research, development, test, and evaluation on medical devices for use on medical and casualty evacuation aircraft.

*Gentex Corporation* for collaboration on research and development of testing techniques of aircraft safety equipment.

**\*\*Georgia Institute of Technology** to provide a mechanism for USAARL scientists to loan equipment and software which will facilitate their research into bone conduction communications and to mentor students involved in this research.

*GlaxoSmithKline* in support of a clinical research study entitled “Effects of Omega-3 EPA/DHA for Soldiers at Risk for Mood Disorders: A Combat Resilience Trial.”

*Hospira, Inc.* for collaborative research, development, test, and evaluation on medical devices for use on medical and casualty evacuation aircraft.

*Insight Technology, Inc.* for evaluation of the Panoramic Night Vision Goggles (PNVG) system.

*Masimo Corporation* for collaborative research, development, test, and evaluation on medical devices for use on medical and casualty evacuation aircraft.

*Medical Education Technologies, Inc.* for collaborative research, development, test, and evaluation on medical devices for use on medical and casualty evacuation aircraft.

*Natus Medical, Inc.* for loan of the Navigator Pro AEP software Version 7.0 to the USAARL for data collection.

## **U.S. Army Aeromedical Research Laboratory — Fiscal Year 2010**

*NavigSys Innovations, Inc* for evaluation of the efficacy of the TSAS belt over moving targets.

*Oregon Aero, Inc.* for collaboration on testing of HGU-56/P-specific Oregon Aero helmet liners and components for use in the Army flight helmet.

*Phillips Medical Systems, North America* for collaborative research, development, test, and evaluation on medical devices for use on medical and casualty evacuation aircraft.

*Physio-Control, Inc.* for collaborative research, development, test, and evaluation on medical devices for use on medical and casualty evacuation aircraft.

*Remote Diagnostic Technologies, LTD* for collaborative research, development, test, and evaluation on medical devices for use on medical and casualty evacuation aircraft.

*Skedco, Inc.* for evaluation of the Skedco Universal Litter Tie Down Strap and Patient Litter Strap for use on medical and casualty evacuation aircraft.

**\*\*Sound Innovations** (CRADA and MTA) for in-flight comparative testing of the ANR Communication Earplug (ACE™) with other talk-through, sound localization, and impulse suppression devices.

*SUNY State College of Optometry* for research to provide novel strategies for the treatment of traumatic brain injuries associated with visual dysfunction and methods to test visual dysfunction in the presence of cognitive impairment in both military and civilian populations.

*Thornhill Research, Inc.* for cooperative research, development, test, and evaluation of medical devices for use on medical and casualty evacuation helicopters.

*Twin Star Medical, Inc.* for collaborative research, development, test, and evaluation on medical devices for use on medical and casualty evacuation aircraft.

*United Kingdom Defence Medical Rehabilitation Center* (DMRC) to loan a Vibrotactile Balance Rehabilitation Device to the DMRC which they will assess for efficacy in assisting injured service personnel to re-learn balance as part of their rehabilitation process.

*USAARL/Applied Research Associates, Inc./Duke University/T.R.U.E. Research Foundation* to develop a transfer function and numerical model which translates the helmet-mounted sensor response data to head-centered biomechanical responses in support of the DoD Congressionally Directed Medical Research Program's (CDMRP's) Psychological Health/Traumatic Brain Injury (PH/TBI) Research Program Award for the proposal PT075837, entitled "Helmet Sensor-Transfer Function and Model Development."

## **U.S. Army Aeromedical Research Laboratory — Fiscal Year 2010**

*USAARL/ClinVest/ T.R.U.E. Research Foundation* (CRADA and 2 MTAs) to test the hypothesis that mild to moderate hypoxic hypoxia reversibly uncovers neurological deficits in individuals who have experienced mild traumatic brain injury and who appear asymptomatic when breathing air with normal sea level concentrations of oxygen in support of the DoD PH/TBI Research Program of the Office of the CDMRP, TBI Investigator-Initiated Research Award proposal PT075175 entitled “The Effects of Hypoxia on Cognitive Function in Aviators and Complex System Operators that have had a Mild Traumatic Brain Injury.”

*USAARL/SUNY/T.R.U.E. Research Foundation* in support of the USAMRMC Intramural War Supplemental Program (IWSP) Award for the proposal CWS\_08\_R2\_290, “Determination of novel Strategies for Hastening Corneal Wound Healing and Reducing Tissue Inflammation.”

*USAARL/T.R.U.E. Research Foundation* in support of the CDMRP’s PH/TBI Research Program Award for the proposal PT075813, “Auditory, Vestibular, and Cognitive Effects Due to Repeated Blast Exposure on the Warfighter.”

*USAARL/T.R.U.E. Research Foundation* in support of the USAMRMC IWSP Award for the proposal CWS\_08\_R3\_110, “Auditory, Vestibular, and Cognitive Effects from Repeated Blast.”

*USAARL/Virginia Tech/T.R.U.E. Research Foundation* in support of the USAMRMC IWSP Award for the proposal CWS\_08\_R3\_130, entitled “Facial Fracture Injury Risk Functions for Assessing the Performance of Improved Face and Eye Protective Equipment.”

*\*\*Utah State University* for collaborative basic and applied research in evaluating hearing processes, hearing protective devices, and speech communication.

*Verathon Medical, Inc.* for collaborative research, development, test, and evaluation on medical devices for use on medical and casualty evacuation aircraft.

*Wayne State University* for loan by the USAARL to the College of Engineering a FOCUS head form.

*Welch-Allyn, Inc.* for collaborative research, development, test, and evaluation on medical devices for use on medical and casualty evacuation aircraft.

*Zoll Medical Corporation* for collaborative research, development, test, and evaluation on medical devices for use on medical and casualty evacuation aircraft.

**\*\*CRADA/MTA includes loan of excess research equipment to these institutions.**

## **U.S. Army Aeromedical Research Laboratory — Fiscal Year 2010**

### **Science Information Center**

The Science Information Center (SIC) library provided the information necessary to support the research performed at USAARL and disseminated scientific information to requestors worldwide. It also supported the staffs of Lyster Clinic, the U.S. Army Aeromedical Activity, and the U.S. Army School of Aviation Medicine including the Flight Surgeon Courses held at Fort Rucker throughout the year. The library holdings are believed to comprise the most comprehensive aviation medicine collection in this part of the country. Additionally, the SIC is a member of a national library consortium that, through interlibrary loans, exponentially expands each member's resources at minimal cost to each member.

The Office of the Writer-Editor contributed to the quantity and quality of publications to include USAARL technical reports, open literature publications, and public relations brochures and pamphlets created to describe and promote the research conducted by the USAARL scientists and engineers; served as grants administrator and contributed toward group efforts to secure several federal research grants; and consolidated and expanded a public relations program aimed at marketing USAARL's unique talents and assets.

The Office of the Research and Technology Applications (ORTA) administered USAARL's technology transfer program.

**U.S. Army Aeromedical Research Laboratory — Fiscal Year 2010**

**Resources Management**

Program funding for FY10/FY11 (dollars in thousands):

	FY10	FY11
6.1 Basic Research	175	172
6.2 Applied Research	7,785	8,056
6.3 Advanced Technology Development	1,868	2,191
6.4 Demonstration and Validation	616	400
6.5 Engineering and Manufacture Development	392	400
Other	5,205	3,839
<hr/>		
TOTAL	\$16,041	\$15,058



## U.S. Army Aeromedical Research Laboratory — Fiscal Year 2010

### Training

The USAARL's training program for FY10 included 64 training experiences. Training encompassed supervisory development training, training required by the Army for our Warfighters, and training to help employees perform more effectively in their current positions.

The following Laboratory-wide training was conducted for all USAARL personnel:

October:	Cold Weather Training Sergeant's Time Training (STT) Military Occupation Specialties (MOS) Training Noncommissioned Officer Development Program (NCODP) – Education Army Physical Fitness Training (APFT)
November:	Land Navigation NCODP STT – Ground Guiding a Vehicle NCODP STT MOS Training
December:	Annual Security Refresher Training STT NCODP MOS Training
January:	STT – Commissioning Programs EO Training MOS Training Prevention of Sexual Harassment (POSH) Training NCODP – Noncommissioned Officer Evaluation Reports (NCOER) Part I
February:	STT NCODP – NCOER Part I MOS Training
March:	NCODP – Counseling STT – Tactical Combat Casualty Care (TC3) MOS Training NCODP – Roles and Responsibilities of a Noncommissioned Officer (NCO) STT – BRM Part III Safe Home Computing, Anti-Phishing, G3 Security
April:	STT – Advanced Rifle Marksmanship (ARM) Training EO Training MOS Training NCODP – Troop Leading Procedures APFT

## **U.S. Army Aeromedical Research Laboratory — Fiscal Year 2010**

May: STT – Awards  
STT – Mouth to Mouth Resuscitation/Evaluate a Casualty  
ARM  
MOS Training

June: STT – React to Direct/Indirect Fire  
NCOPD  
STT

July: MOS Training  
STT – Hazardous Waste Management  
POSH Training  
STT – Nuclear, Biological, and Chemical (NBC) Overview Part I  
NCOPD – Personnel Inspections  
STT – NBC Overview Part II

August: STT – Set-up and Operate SINCGARS  
NCOPD – Decision Making Process  
STT – Team Building  
STT – Occupy a Forward Operating Base (FOB)

September: NCO/ Soldier of the Quarter Board  
NCO/ Soldier of the Year Board  
NCOPD – Family Care Plan/Family Readiness Group  
NCOPD – Awards Writing  
STT – Preventative Medicine Measures

Dates varied by individual for the following annual mandatory training requirements:

- Information Assurance Awareness Training (online)
- Anti-Terrorism Training (online)
- Health Insurance Portability and Accountability Act (HIPAA) Refresher Training (online)
- Composite Risk Management Training (online)
- Employee/Supervisor Safety Training (online)
- Combating Trafficking in Persons (online)
- EO Training

## **U.S. Army Aeromedical Research Laboratory — Fiscal Year 2010**

### **Computer Information**

#### **Network Infrastructure Improvements**

A new security system entailing all interior and exterior doors was installed on its own internal network with one server controlling the system.

The Information Management/Information Technology Branch continued replacing file servers for backing up the ever-increasing load of data.

#### **Security Improvements and Upgrades**

Credant encryption software was installed on all USAARL laptop and desktop personal computers whether they are connected to the AMEDD domain or not.

#### **Wireless Communications**

Twenty two Blackberry™ devices were used by staff members; the devices provided phone, email, and internet access from one handheld device.

Sixteen Verizon Air Cards were used by staff members; the devices provided internet access from virtually any CONUS location.

## **U.S. Army Aeromedical Research Laboratory — Fiscal Year 2010**

### **Personnel**

This fiscal year, six contractor authorizations were successfully converted to civilian authorizations to better align and support research mission objectives requiring inherently governmental oversight. In addition to the work force described below, USAARL had a monthly average of 18 over-hires, 11 terms, and 37 non- Table of Distribution and Allowance (TDA) personnel during FY10. Non-TDA personnel include Student Temporary Employment Program (STEP) personnel (8), on-site research and research support contractor personnel, exchange officers, and casual officers.

Required strength was 27 officers, 1 warrant officer, 33 enlisted, and 72 civilians for a total of 139 requirements. Authorized were 16 officers, 1 warrant officer, 27 enlisted, and 46 civilians for a total authorized strength of 96. The average assigned strength was 11 officers, 1 warrant officer, 21 enlisted, and 74 civilians for an average assigned strength of 107.

USAARL employs a highly skilled and trained work force with 73% of assigned employees possessing higher education degrees. The types of degrees held by Laboratory employees as of 30 September 2010 were: 8 M.D., 17 Ph.D., 1 Au.D., 13 Master, 30 Bachelor, and 9 Associate degrees.

## **U.S. Army Aeromedical Research Laboratory — Fiscal Year 2010**

### **Equal Employment Opportunity Program**

The USAARL Equal Employment Opportunity (EEO) coordinator completed quarterly EEO reports for the USAARL Commander for submission to the Commander, USAACE, Fort Rucker, AL, through the USAACE, Fort Rucker EEO office. These reports identified the USAARL's EEO objectives, actions to be taken to meet objectives, and accomplishments in meeting the objectives through hiring actions, promotions, details or temporary promotions, awards, training, and supervisors' support of the EEO program.

All Department of the Army civilian employees and supervisors of civilian employees who required training in FY10, completed the Department of Army's POSH and No Fear Act training courses or New Employee Orientation (NEO) training. Reports were completed for submission to the Fort Rucker EEO office.

The USAARL EEO coordinator served on the USAACE, Fort Rucker Dr. Martin Luther King, Jr. Commemorative Program planning committee. The USAARL EEO coordinator, served on the planning committee for another very successful, post-wide, Armed Services Blood Program (ASBP) blood drive, sponsored by USAARL, Lyster Army Health Clinic, and the 1-13th AVN RGT. The USAARL EEO coordinator, EO leaders, and other military personnel provided support to the ASBP team throughout the day and evening of the blood drive. Each team member received a USAARL Certificate of Appreciation.

A USAARL civilian employee is a Department of Army certified EEO counselor and serves the USAACE, Fort Rucker EEO office.

African-American or Black Civilian Employees: As of 30 September 2010, USAARL employed 10 African-American or Black civilian employees (six females and four males), for a representation of 13% of civilian employees. Three African-American or Black employees received an "A" performance evaluation with a pay for performance and four received a "B" performance evaluation with a pay for performance.

Hispanic Civilian Employees: USAARL employed four Hispanic employees (two females and two males), a representation of 5% of civilian employees, during FY10. One Hispanic employee received an "A" performance evaluation with a pay for performance and one received a "B" performance evaluation with a pay for performance. One Hispanic employee was ineligible due to her length of employment at USAARL.

Female Civilian Employees: During FY10, USAARL employed 24 female employees, a representation of 45% of civilian employees. Nineteen female employees received an "A" performance evaluation with a pay for performance and five received a "B" performance evaluation with a pay for performance.

Handicapped Civilian Employees: USAARL employed one handicapped employee in FY10.

## **U.S. Army Aeromedical Research Laboratory — Fiscal Year 2010**

### **Personnel Achievements**

Civilian Awards: The following are civilian awards presented during FY10 at USAARL:

- 37 Pay for Performance As
- 22 Pay for Performance Bs
- 1 Invention Award
- 11 Time-Off Awards (TOA)
- 13 On-The-Spot Cash Awards
- 3 Special Act/Service Awards
- 15 Certificates of Appreciation
- 3 Achievement Medals for Civilian Service
- 3 Length of Service Awards

108 Total Civilian Awards

Civilian Promotions: One white female, Research Psychologist, from DB-0180-02 to DB-0180-03.

## U.S. Army Aeromedical Research Laboratory — Fiscal Year 2010

### Key Committee/Organization Participation

<b>Acoustical Society of America</b>	Fellow	Dr. W. A. Ahroon
<b>Aerospace Medical Association</b>	Fellow	Dr. J. S. Crowley
	Member	LTC S. E. Phelps
	Member	LTC S. J. Gaydos
Scientific Program Committee	Member	Dr. J. S. Crowley
	Member	Dr. A. Estrada
	Member	Dr. L. A. Temme
<b>American Academy of Optometry</b>	Fellow	MAJ J. E. CapoAponte
<b>American Board of Preventive Medicine (ABPM)</b>	Vice Chair, Aerospace Medicine	Dr. J. S. Crowley
	Diplomate	LTC S. J. Gaydos
Aerospace Medicine Examination Subcommittee of the ABPM	Chairman	Dr. J. S. Crowley
<b>American Board of Emergency Medicine</b>	Diplomate	LTC S. J. Gaydos
<b>American College of Emergency Physicians</b>	Member	LTC S. J. Gaydos
<b>American National Standards Institute</b>		
Accredited Standards Committee S3 Bioacoustics	Representative	Dr. W. A. Ahroon
Accredited Standards Committee S12 Noise	Representative	Dr. W. A. Ahroon
Z90.1 Helmet Committee	Member	Mr. B. J. McEntire
S12 Hearing Protection Attenuation and Performance, Working Group 11	Member	Dr. W. A. Ahroon
S12 Measurement of the Noise Attenuation of Active and/or Passive Level Dependent Hearing Protection Devices, Working Group 39	Member	Dr. W. A. Ahroon
S12.7 Methods for Measurement of Impulse Noise, Working Group 32	Member	Dr. W. A. Ahroon

**U.S. Army Aeromedical Research Laboratory — Fiscal Year 2010**

<b>American Optometric Association</b>	Member	MAJ J. E. CapoAonte
<b>American Society for Testing and Materials</b> F30-01, EMS Equipment	Member Member (Non-Voting)	Dr. K. W. Barazanji Mr. R. Eshelman
<b>Army Aviation Medicine Association</b>	Member Member Member	COL J. F. McKeon Dr. J. S. Crowley LTC S. E. Phelps
<b>Association for Aviation Psychology</b>	Member	Ms. C. M. Webb
<b>Association for Psychological Science</b>	Member	Dr. A. M. Kelley
<b>Association for Research in Vision and Ophthalmology (ARVO)</b>	Member	MAJ J. E. CapoAonte
<b>Cognitive Science Society</b>	Member	Dr. A. M. Kelley
<b>Department of the Army</b> Advanced Night Vision Goggle (ANVG) Program	Member	Dr. W. E. McLean
U. S. Army ALSE Steering Council	Member	Mr. K. Northcutt
Life Support Equipment Steering Committee	Member	Mr. K. Northcutt
Air Warrior System Safety Working Group	Member Assoc. Member Assoc. Member	Mr. K. Northcutt Mr. B. J. McEntire Dr. J. S. Crowley
Joint Aircrew Executive Steering Council	Member	Mr. B. J. McEntire
Team Air Warrior Management Working Group	Member	Mr. K. Northcutt
AH-64 System Safety Working Group	Member	Mr. K. Northcutt
Kiowa Warrior, OH-58D System Safety Working Group	Member	Mr. K. Northcutt
Military Eye Protection System (MEPS)	Member	Dr. W. E. McLean



**U.S. Army Aeromedical Research Laboratory — Fiscal Year 2010**

**Department of the Army (continued)**

Explosion Ordnance Disposal Working Group	Member (Non-Voting)	Dr. W. E. McLean
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OMNI 6 ANVIS	Member	Dr. W. E. McLean
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**Department of Defense**

Armed Forces Optometric Society	Member	MAJ J. E. CapoAponte
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Auditory Research Working Group	Member	Dr. W. A. Ahroon
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Defense Medical Standardization Board, Test, Evaluation, and Standards Working Group	Member Member Member	Dr. K. W. Barazanj Mr. R. Eshelman Mr. B. Bowers
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Global Patient Movement Joint Advisory Board (PMJAB)	Member Member	Dr. K. W. Barazanj Mr. B. Bowers
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Hearing Conservation Working Group	Member	Dr. W. A. Ahroon
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Joint Cockpit Airbag System Working Group	Member	Mr. B. J. McEntire
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Joint Service Aviation Mask (JSAM)	Member (Non-Voting)	Dr. W. E. McLean
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Joint Service General Purpose Mask Working Group	Member (Non-Voting)	Dr. W. E. McLean
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Oxygen Standardization Coordinating Group (OSCG)	Member Member	Dr. K. W. Barazanj Mr. B. Bowers
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Triservice Aircrew System Sub-Board	Member	Mr. K. Northcutt
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Triservice Aviator Helmet Standardization Working Group	Member Member	Mr. K. Northcutt Mr. B. J. McEntire
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Triservice Biodynamics Working Group	Chairman	Mr. B. J. McEntire
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Triservice Enhanced Noise Reduction (TENOR)	Member Member	Dr. W. A. Ahroon Ms. E. Gordon
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**U.S. Army Aeromedical Research Laboratory — Fiscal Year 2010**

<b>Department of Defense (continued)</b>		
Triservice Working Group on Helmet Mounted Displays	Member	Mr. C. E. Rash
<b>Federal Laboratory Consortium</b>	Member	Ms. D. L. Hemphill
<b>Human Factors Society</b>		
Perception and Performance Technical Group	Member	Dr. L. A. Temme
<b>Kansas State University, Human Metabolism Department</b>	Adjunct Professor	CPT M. Dretsch
<b>National Academy of Practice in Optometry</b>	Distinguished Scholar	MAJ J. E. CapoAponte
<b>National Board of Examiners in Optometry</b>	Examiner	MAJ J. E. CapoAponte
<b>National Hearing Conservation Association</b>	Director of Education	LTC Kristen Casto
<b>National Security Science and Engineering Faculty Fellowship Program</b>	Technical Review Panel Member	Dr. M. R. Lattimore
<b>Office of the Secretary of Defense, Phase 1, Small Business Innovation Research Proposals</b>		
SD09-H22, Treatment of mTBI Balance Dysfunction via Multimodal Biofeedback	Chief Technical Reviewer	Dr. B. D. Lawson
<b>Society for Judgment and Decision Making</b>	Member	Dr. A. M. Kelley
<b>Society of U.S. Army Flight Surgeons</b>	Member	COL J. F. McKeon
	Member	Dr. J. S. Crowley
	Member	LTC S. E. Phelps
	Member	LTC S. J. Gaydos
<b>State University of New York (SUNY), State College of Optometry</b>	Adjunct Professor	MAJ J. E. CapoAponte
<b>United States Air Force Aerospace Medicine Residency Advisory Committee</b>	Member	COL J. F. McKeon
<b>University of Texas Medical Branch, Galveston</b>	Adjunct Faculty	COL J. F. McKeon

## U.S. Army Aeromedical Research Laboratory — Fiscal Year 2010

### **U.S. Army Medical Research and Materiel Command**

System Biology Integrated Product Team	Member	CPT M. Dretsch
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### **U.S. Army Aviation Warfighting Center**

Equal Employment Opportunity Committee	Coordinator	Ms. E. Gordon
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Fort Rucker Emergency Management Working Group	Member	Mr. J. Miller
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Fort Rucker Environmental Management Committee	Member	Mr. J. Miller
	Member	Mr. A. Roddy

Fort Rucker Ergonomics Committee	Member	Mr. J. Miller
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Fort Rucker Safety and Occupational Health Committee	Member	Mr. J. Miller
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Life Support Equipment Steering Committee	Member	Mr. K. Northcutt
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Night Vision Goggle Working Group	Member	Dr. W. E. McLean
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U.S. Army Aeromedical Consultant Advisory Panel, USAAMC	Member	COL J. F. McKeon
	Member	Dr. J. S. Crowley
	Member	LTC S. E. Phelps

<b>U.S. Army Optometry Residency Selection Board</b>	Member	MAJ J. E. CapoAponte
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### **U. S. Army Research Laboratory**

Cognition and Neuroergonomics Collaborative Technology Alliance, Source Selection Evaluation Board	Member	Dr. A. M. Kelley
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### **U.S. Army/Navy Aerospace Medicine Residency Program**

Residency Advisory Committee	Member	COL J. F. McKeon
	Member	Dr. J. S. Crowley

<b>Women in Cognitive Science</b>	Member	Dr. A. M. Kelley
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<b>Troy University</b>	Adjunct Professor	Dr. A. M. Kelley
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## U.S. Army Aeromedical Research Laboratory — Fiscal Year 2010

### International Committees

<b>Air and Space Interoperability Council</b>	Army Rep.	Dr. J. S. Crowley
Agile Combat Support Working Group	Army Rep.	Dr. K. W. Barazanji
<b>International Academy of Aviation and Space Medicine</b>	Academician	Dr. J. S. Crowley
Science Review Committee	Member	Dr. J. S. Crowley
<b>International Association of Military Flight Surgeon Pilots</b>	Member	LTC S. J. Gaydos
<b>International Virtual Reality Conference</b>	Program Committee Member	Dr. B. D. Lawson
<b>North Atlantic Treaty Organization Research and Technology Organization</b>		
AVT-097, Equipment for Personal Protection Technical Team	Member	Dr. J. S. Crowley
Research and Technology Group Ground Based Spatial Disorientation Training	Army Rep.	Dr. A. Estrada
HFM-084, Unmanned Aerial Vehicle (UAV) MEDEVAC Operations	Member	Mr. J. G. Ramiccio
HFM-157, Medical Challenges in the Evacuation Chain	Member	Dr. K. W. Barazanji
HFM-162, Rotary Wing Brownout	Member	Dr. A. Estrada
HFM-164, Psychological Aspects of Health Behaviors on Deployed Military Operations	Member	Dr. A. M. Kelley
HFM-171, Psychological and Physical Selection of Military Special Units	Member	Dr. J. S. Crowley
HFM-180, Strategies to Address Recruiting and Retention Issues in the Military	Member	Dr. M. R. Lattimore
HFM-181, Human Performance Enhancement for NATO Military Operations	Member	Dr. J. S. Crowley

## U.S. Army Aeromedical Research Laboratory — Fiscal Year 2010

HFM-184, Safe-Ride Standards for UAS-Casualty Evacuation	Member Member	Dr. K. W. Barazanji Mr. J. G. Ramiccio
HFM-190, Oxygen Solutions for Unpressurized Aircraft Operating below 18,000 feet (Hypoxia prevention).	Member	Mr. J. G. Ramiccio
HFM-ET-086, Database of Biomechanical Analyses	Member Member	LTC S. E. Phelps Mr. F. T. Brozski
HFM-ET-082, Requirements for Oxygen Systems for Rotary Wing Aircraft	Member	Mr. J. G. Ramiccio

### **The Technical Cooperation Program**

HUM Subgroup, Technical Panel 7, Human Factors in Aircraft Environments	Army Rep. U.S. National Leader	Dr. J. S. Crowley
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## Miscellaneous Committees

### **Journal Review Board**

Aviation, Space, and Environmental Medicine	Reviewer Reviewer Reviewer Editorial Board Member	Dr. J. S. Crowley Dr. W. E. McLean Dr. B. D. Lawson Dr. J. S. Crowley
International Journal of Human-Computer Interaction	Editorial Review Board Member	Dr. B. D. Lawson
Journal of Audiology and Neurotology	Reviewer	Dr. B. D. Lawson
Journal of Experimental Brain Research	Reviewer	Dr. B. D. Lawson
Journal of Vestibular Research	Reviewer	Dr. B. D. Lawson
Military Medicine	Reviewer	Dr. J. S. Crowley



Department of the Army  
U.S. Army Aeromedical Research Laboratory  
Fort Rucker, Alabama, 36362-0577  
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U.S. Army Medical Research and Materiel Command